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VIEWS, NEWS AND INTERVIEWS.

A recent storm at Brunswick, Ga., destroyed the gas and electric lighting plant, valued at $25,000.

A Washington, D. C., chemist claims to have discovered a process for making chemically pure whisky by means of electricity.

According to the San Francisco *Argonaut*, it was E. Peshine Smith, the grandfather of Mrs. Rudyard Kipling, who originated the word "telegram."

The city of Columbus, O., will probably appoint a committee of citizens to report on the best fender or other life-saving device for use on electric cars.

The Indiana Supreme Court at Indianapolis has rendered a judgment against the Western Union Telegraph Company for delinquent taxes and 50 per cent penalty. The litigation lasted three years, and a large amount is involved.

Clifford B. Everham, manager of the gold and stock department, in Chicago, of the Western Union Telegraph Company, was stricken with heart disease on October 5, while testifying in Judge Tuthill's court in a wire-tapping case, and almost instantly expired. Mr. Everham was known as an expert telegrapher throughout the West.

The work of extending the great wheelpit of the Niagara Power Company's plant for seven additional turbines and dynamos has now been under way for some time. It is being pushed forward as rapidly as possible. There are two gangs, of 75 men each, employed night and day, and the excavation in the solid rock has reached a depth of about 45 feet. The cut is 240 feet long and 20 feet wide. The depth, when completed, will be 185 feet and it is thought it will take about a year to finish the work.

The Earl of Selborne presided over a meeting in London on October 6, called for the purpose of inaugurating the international submarine telegraph memorial. In the course of his speech in taking the chair, the Earl said that the object of the meeting was to put upon record the administration of the authors of the international submarine telegraphy, especially Cyrus W. Field, Sir John Pender and James Anderson. A committee was appointed to consider the form of the memorial. The committee includes Viscount Peel, Lord Kelvin, Lord Tweeddale and George von Chauvin, representative of the Western Union Telegraph Company of the United States in London.

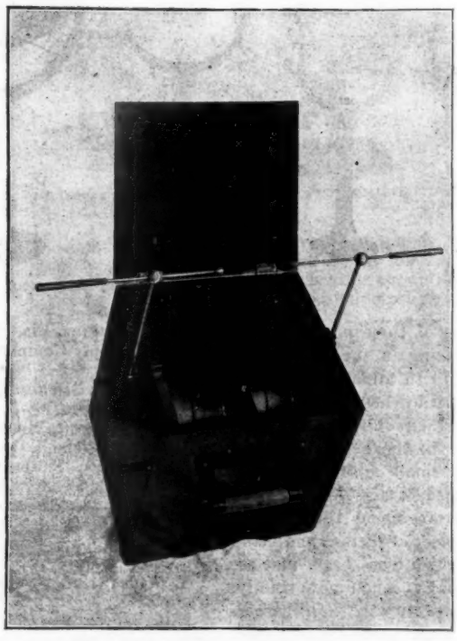


Fig. 1.—The Thomson Inductorium. (See "Roentgen-Ray Apparatus," page 188.)

A railroad telegraph superintendent, in speaking of telegraph poles, said: "In Arizona there is a sort of woodpecker that picks the posts absolutely to pieces, thinking there may be insects inside of the wood. They hear the humming, and haven't sense enough to know what causes it. Then near the hills the black bears imagine that each pole contains a swarm of bees, and they climb to the top and chew the glass insulators to pieces; but the sand storms are the things that create the most havoc. When the winds blow strongly the sand is drifted at a rapid rate, and the grains cut away the wood at a fearful rate. It was a common thing to have an oak pole worn to a shaving in a day's time, while I have seen poles just ground to the surface of the earth during a single storm. Things got so bad out there that the company decided to substitute steel poles for the oak and cedar, but that didn't remedy the evil at all. The sand just wore away the metal on each side of the pole until the center was as sharp as a razor, and all the Indians used to shave themselves on the edge. We finally managed to fix things. Just painted the poles with soft pitch. The pitch caught the sand, and now every pole is about two feet thick and solid as a rock."

STREET RAILWAY MEN.

Annual Meeting of the American Street Railway Association, To Be Held at St. Louis, October 20.

A LARGE ATTENDANCE AND VERY EXTENSIVE EXHIBITIONS OF APPARATUS EXPECTED.

The next convention of the American Street Railway Association will be held at St. Louis, beginning October 20 and continuing for three days. The programme, which has heretofore been published in the Electrical Review, will consist of a number of timely papers on practical subjects with the discussion which naturally accompanies the presentation of such addresses. The vast capital invested in this field makes it one of the most prominent industries of the country, and the sway of electricity is such that almost all other subjects are but slightly treated. Of course, in a few of the larger cities there are still some cable railways, and in poor old New York city some horse cars also.

A conspicuous feature of this convention, and one which will certainly prove a drawing card, is the large exhibition space, which has been taken by large manufacturers for the purpose of presenting exhibits of their product as well as using the spaces for headquarters in which to meet their customers. The large building used by the National Republican Convention has been engaged for the use of the street railway men, and all of the exhibition space has been called for, and the management found that they could have disposed of additional space if they had had it to command. The convention room is in the same building, immediately adjoining the exhibits,

thus making it very convenient for all who attend.

It is thought that there will be a large enough attendance from the East to fill one or more special trains. One special leaves New York over the New York Central by way of Albany, Syracuse, Buffalo, etc., on Saturday (not Sunday), October 17, at 1 P. M., arriving in St. Louis Sunday evening about six o'clock. Passengers from New England, who come by way of Albany, will be provided with accommodation on that train.

The Pennsylvania road will also run a train, leaving New York at 2 P. M., which will accommodate the people who wish to attend the convention from along the line of this road. It is expected there will be special cars from Chicago and the West, and altogether the attendance promises to be very large and thoroughly representative of the street railway interests of the United States. The officers of the association at the present time are the following-named gentlemen:

President, H. M. Littell, vice-president and general manager of the Metropolitan Street Railway Company, New York.

Vice-presidents, Granville C. Cunningham, manager Montreal Street Railway Company, Montreal, Canada; William H. Jackson, president Nashville Street Railway Company, Nashville, Tenn.; J. Willard Morgan, president Camden, Gloucester & Woodbury Railroad Company, Camden, N. J.

Secretary and treasurer, T. C. Penington, treasurer Chicago City Railway Company, Chicago, Ill.

Executive committee: President, vice-presidents and Joel Hurt, president Atlanta Consolidated Street Railway Company, Atlanta, Ga.; Prentiss Cummings, vice-president West End Railway Company, Boston, Mass.; C. G. Goodrich, vice-president Twin Cities Rapid Transit Company, St. Paul, Minn.; A. Markle, general manager Lehigh Traction Company, Hazelton, Pa.; W. F. Kelley, general manager Columbus Street Railway Company, Columbus, Ohio.

The change to Saturday in the time of the New York Central train has been made to accommodate a large number of passengers who desired to be in St. Louis on Monday to prepare their exhibits.

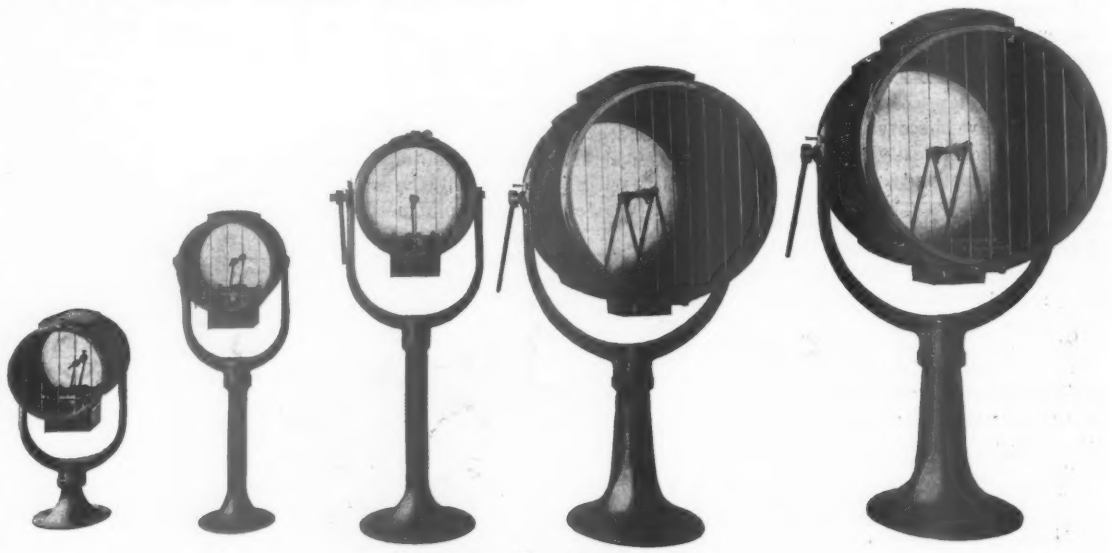
The Rushmore Electric Projectors.

The development of the electric search-light is a fair example of the effect of specializing in the manufacture of electrical apparatus, and the manner in which, in little over a year, this formerly intricate and costly apparatus had been simplified and perfected and reduced in cost, is certainly wonderful.

Until this year there were no real search-lights in use, except in the navy, and the naval lights were clumsy and complicated, and possessed the single redeeming feature of the expensive lenses imported from France, and which only a first-class government could raise money to pay for. Realizing that there was a good demand for a perfect search-light, Mr. S. W. Rushmore investigated the subject, and, finding that the old method of making the large lenses required could not be employed except at enormous cost and after years of study and experiment, he succeeded in producing the special glass castings required, and perfected a machine for their finishing that brought the cost to but a fraction of that by the old methods. He also perfected a lamp mechanism that, while containing fewer parts than the common street lamp, will feed the heavy carbons toward or away from each other with scarcely a volt variation, and keep the light in perfect focus. This is claimed to be the only arc lamp in use that feeds the carbons in both directions, while having no motors or contact devices of any kind.

This lamp, with the new lens mirror mounted in a sheet-metal cylinder, forms the modern high-power projector, as made by the Rushmore Dynamo Works, of Jersey City, N. J.

The accompanying illustration shows a line of these projectors from 10 inches to 34 inches diameter, and of capacity of from 5 to 150 amperes.



Examples of Rushmore Projectors.

Other forms of these projectors are made for placing on the roof of the pilot house, with attachments below to be operated by the pilot, and other forms, used chiefly in the navy, have a small motor in the base with wires leading to a small controller, which may be placed at any distance, and with this arrangement the operator may be in a place of shelter, and, being away from the intense beam may see the distant object much more readily.

These lights are wind and weather-proof and work perfectly in a gale. They are so reliable, and of such enormous power, and sell at such low price, that they are already in extensive use in all parts of the world and in the United States and foreign navies.

A number of wide-awake advertisers have been quick to appreciate the value of these lights, and a number of tall buildings in the large cities are already equipped with powerful lights that throw their rays for miles around and attract the attention of all who may be out of doors. One of these 34-inch, 100-ampere projectors is mounted on the lofty tower of the great department store of Siegel-Cooper & Company, New York city, which burns every night and throws a beam, said to be visible over 80 miles in all directions.

Meeting of Incandescent Lamp Manufacturers.

The meeting of manufacturers of incandescent lamps and sockets was held on Friday of last week, under the auspices of the National Electric Light Association, in the rooms of the American Institute of Electrical Engineers. The gentlemen present were:

Frederic Nicholls, of Toronto, president National Electric Light Association.

Geo. F. Porter, of New York, secretary National Electric Light Association.

Chas. I. Hills, Perkins Electric Switch Manufacturing Company, Hartford, Ct.

W. C. Bryant, Bryant Electric Company, Bridgeport, Ct.

C. E. Scott, Bristol Electric Light Company, Bristol, Pa.

A. A. Pope, Edison Electric Illuminating Company, New York.

A. D. Page, Harrison Lamp Works, Harrison, N. J.

M. K. Eyre, General Electric Company, New York.

F. W. Hawkins, Electric Engineering and Supply Company, Syracuse, N. Y.

A. B. Field, Anchor Electric Company, Boston, Mass.

C. H. Rockwell, Buckeye Electric Company, Cleveland, Ohio.

F. S. Terry, Sunbeam Incandescent Lamp Company, Chicago, Ill.

C. D. Marsh, Bryan-Marsh company, New York.

A. P. Seymour, Pass & Seymour, Syracuse, N. Y.

S. Wheelwright, John E. Crigal, Newark, N. J.

H. C. Wirt, General Electric Company, New York.

E. E. Ries, New York.

Chas. W. Price, ELECTRICAL REVIEW.

W. F. Hanks, *Electrical Engineer*.

W. J. Johnston, *Electrical World*.

Mr. Frederic Nicholls, president of the National Electric Light Association, in opening the meeting spoke as follows:

"In order that there may be no misunderstanding in regard to the attitude of the National Electric Light Association, I take the opportunity of stating before the business of the meeting commences that on behalf of the association I have endeavored to bring together the several interests here represented for the purpose of discussing the question at issue, and of trying to solve the somewhat difficult problem of standardizing the incandescent lamp socket and lamp base. This association is absolutely impartial, and it was thought that more could be accomplished by holding such a meeting under neutral auspices than in any other way. The object of the association in bringing together such a representative gathering having now been obtained, it becomes your duty to elect a chairman."

On motion, Mr. Nicholls was requested to act as chairman and Mr. Geo. F. Porter as secretary.

Resolution No 1, moved by Mr. F. S. Terry; seconded by Mr. Hills:

That it is the opinion of those present at this meeting that a standard lamp socket and lamp base are desirable.

Carried.

A long general discussi n then ensued, nearly every gentlemen present taking part, and many facts of interest were brought out, and seeming difficulties were debated as they arose.

The final results of the meeting are set forth in the following resolutions, which in each case were carried unanimously, it being understood that another general meeting is to be called to receive the report of the committee appointed.

Resolution No. 2, moved by Mr. Ries; seconded by Mr. Rockwell:

That, before proceeding to investigate the patent situation or licensee question, to obtain the opinion of this meeting as to whether any existing type of socket or lamp base fulfills all the requirements that a standard socket should possess.

Resolution No. 3, moved by Mr. Terry; seconded by Mr. Bryant:

That the most desirable lamp base and socket, in itself considered, is a socket adapted for Edison base lamps.

Resolution No. 4:

Resolved, That a committee, composed of Mr. Terry, Mr. Rockwell, Mr. Bryant and Mr. Hills, be appointed to confer with the licensors and licensees of the socket patents with a view to arranging for their general use, and to report back to a meeting at an early date, and that the president of the National Electric Light Association be requested to act as chairman.

The Clam-Bake Photograph.

The American Electrical Works, Providence, R. I., has issued a large heliograph reproduction of the photograph taken of the 249 guests who attended the eighteenth annual clam-bake tendered to the electrical fraternity last August by President Eugene F. Phillips. The work is a splendid example of the engraver's art, every portrait being distinct and well defined.

The E. S. Greeley & Company in Receivers' Hands.

The E. S. Greeley & Company, manufacturers of telegraph and railway supplies and electrical apparatus, at 5 and 7 Dey street, New York city, and at New Haven, are in financial difficulties, which are believed to be but temporary, and Judge Lacombe, of the United States Circuit Court, has appointed Gen. E. S. Greeley, the president, and James W. Sands, the secretary, receivers of the company. The business was established 40 years ago by L. G. Tillotson & Company. General Greeley became a partner in that firm in 1865, and in 1884 succeeded to the business, after the death of Mr. Tillotson. The firm style was changed to E. S. Greeley & Company, and the business was incorporated in 1887, under Connecticut laws, with a capital stock of $250,000. The liabilities are $160,000, of which $65,000 is for merchandise and $70,000 due on notes. The assets are $180,600.

Under date of October 7, 1896, the E. S. Greeley & Company issued the following circular to its creditors:

We regret to announce that we have been compelled, by reason of the business conditions which have prevailed for some time past and which still continue, to apply for the appointment of receivers of the corporation, and, accordingly, Messrs. Edwin S. Greeley and James W. Sands have been duly appointed as such.

The receivers propose to proceed with all diligence to realize upon the assets of the company to the best advantage, and we sincerely trust that we will be able to pay our creditors a substantial portion of the indebtedness due them respectively.

This step we feel to be for the best interest of all the creditors, and it has already met with the approval of those whom we have consulted in this vicinity most largely interested.

There is no man in the electrical fraternity who possesses a higher reputation for business and personal integrity than General Greeley, and the ELECTRICAL REVIEW undoubtedly expresses the sentiment of his thousands of friends when it hopes that the embarrassment of his firm will be speedily overcome.

X-Ray Apparatus Constructed Under Mr. Edison's Supervision.

The Edison Manufacturing Company, of 110 East Twenty-third street, New York, are just placing on the market a complete series of X-ray apparatus which has been perfected under the personal supervision of Mr. Edison. The company also have ready a range of outfits operated by battery power, and also a special high-speed brake-wheel equipment operated by the Edison current as exhibited by Mr. Edison at the recent Electrical Exposition in New York city. This is the first apparatus for X-ray work Mr. Edison has prepared for general introduction, as it has been his wish to bring it to a high degree of perfection before placing it before the public. The Edison laboratory now has a staff of men employed exclusively in making X-ray focus tubes, and all this work will be under Mr. Edison's guidance.

Roentgen-Ray Apparatus.

The Edison Decorative and Miniature Lamp Department of the General Electric Company, Harrison, N. J., since the inception of the X-ray fad, has been devoting itself to the development and production of a line of

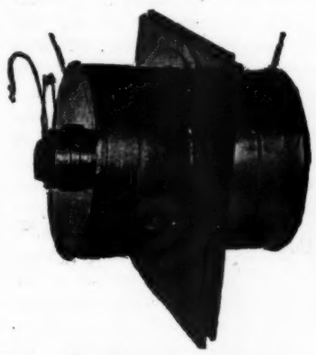


FIG. 2.—THE THOMSON INDUCTORIUM BEFORE MOUNTING IN BOX.

apparatus and supplies for use in X-ray work, and now has one of the most complete and reliable series of these devices on the market. On page 181 of this issue of the ELECTRICAL REVIEW, Fig. 1 shows the

FIG. 3.—ROTARY CIRCUIT-BREAKER FOR THOMSON INDUCTORIUM.

Thomson inductorium, which is also illustrated in Fig. 2, on this page. Fig. 3 shows a rotary circuit-breaker, used with the inductorium, and Fig. 4 illustrates a convenient adjustable tube stand and a Thomson double-focus X-ray tube.

The Thomson inductorium is an induction coil made under the personal direction of Prof. Elihu Thomson. It is an improvement on the ordinary induction coil, and its construction embodies a departure from the old methods of winding and interior insulation. In this way the weight of the coil is reduced below that of the older types rated to give the same length of spark.

In rating the spark capacity of its exciting apparatus the Edison Decorative and Miniature Lamp Department bases its rating on the length for which the apparatus will give a constant stream of working sparks and not the maximum length of spark which can be obtained from it between two points.

The rotary circuit-breaker, illustrated in Fig. 3, is operated by a small motor, and forms part of the equipment of the coil. This motor may be one to operate either upon a few cells of battery or upon an electric light circuit, according to the wishes of the purchaser as expressed at the time of ordering. The contact breaker itself is one of the latest and most improved type, providing for the breaking of the circuit under water, in order to eliminate the sparking which invariably occurs when contact is broken in the air under ordinary conditions.

The vacuum tubes supplied by this company, including the various forms of Thomson focus tubes, are all made in the lamp factory of the General Electric Company at Harrison, N. J., under the supervision of the most experienced class of experts in this line of work.

A 25-Ton Electric Crane.

The Sessions Foundry Company, of Bristol, Ct., have recently erected in their foundry a new 25-ton electric traveling crane, built by the Morgan Engineering Works, of Alliance, Ohio. This makes two cranes of this same type and size. The span is 60 feet and traverse 220 feet.

They are also erecting two six-ton hydraulic jib cranes, built by R. D. Wood & Company, of Philadelphia, Pa. These give them very much increased capacity for making heavy work.

They are also building a new storehouse and making some considerable improvements, among them the substitution of the Boston Blower Company's heating apparatus for the B. F. Sturtevant Company's apparatus.

American Electro-Therapeutic Association.

On September 29, 1896, Prof. William L. Puffer, of the Massachusetts Institute of Technology, lectured on "The Electrical Principles Generally Used in Medical

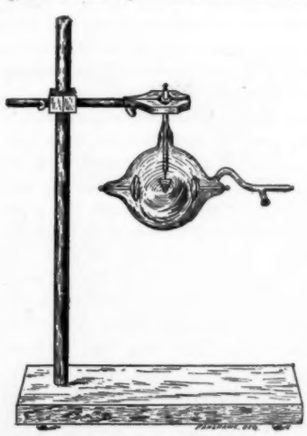


FIG. 4.—ADJUSTABLE TUBE STAND AND THOMSON DOUBLE-FOCUS X-RAY TUBE.

Treatment," and Prof. A. E. Dolbear, of Tufts College, lectured on "The Relation of Physics to Physiology" before the American Electro-Therapeutic Association in New York city.

A. K. Warren & Company's New Quarters.

A. K. Warren & Company have permanently located themselves at 451 and 453 Greenwich street, New York city, in the Trinity Building, opposite their temporary premises in Desbrosses street, in the shops lately occupied by the Garvin Machine Company. A. K. Warren and James Rich Steers, the proprietors, state that they have secured in these premises greater facilities for handling their peculiar business, as the shop, store and offices are all on one large ground floor, greatly facilitating the handling of heavy machinery, which, in repair, constitutes the main part of their business. They also state that their contract department for maintaining electrical plants has met with such success that they have had to engage further experienced help to keep up with the demand for inspections. A visit to their stores will repay all users of electrical machinery, as it will familiarize them with their complete system of handling emergency or breakdown work, which is now reduced to a science. Their telephone, 881 Franklin, is open night and day for calls on this class of work.

The Garvin Machine Company.

The Garvin Machine Company are now settled in their very extensive new building at Spring and Varick streets, New York, where they occupy the entire building, consisting of eight floors and basement. The location of the building is most admirable, as light is secured on four sides, and in the extensive show room of the company on the street floor is presented a very large display of machinery. The officers of the company are three brothers—Mr. G. K. Garvin, president; Mr. Eugene E. Garvin, treasurer, and Mr. F. W. Garvin, secretary. The company's business is very extensive, and they not only supply a large number of electrical and other factories in this country with milling machines, screw machines, lathes and metal working machinery of every description, but they also manufacture a complete line of special bicycle machinery. The Garvin company have a very extensive foreign trade and ship large quantities of their product abroad. The ELECTRICAL REVIEW congratulates this successful company and the active practical young men who manage it on the conspicuous success they have achieved.

American Institute of Electrical Engineers.

The next meeting of the Institute will be held at 12 West Thirty-first street, New York city, on Wednesday evening, October 21, and will be devoted to a topical discussion on the subject of "Electric Traction Under Steam Railway Conditions."

The discussion will be opened by Mr. Chas. E. Emery, and prominent steam engineers as well as electrical engineers have accepted invitations to participate. Arrangements are being made for a similar meeting to be held at Chicago the same evening.

The Jacques Carbon Generator.—A Severe Critic.

[*Editorial in the London Electrical Review*]

We published some time ago (*Electrical Review*, Vol. xxxviii., page 826) an article on a battery invented by Dr. Jacques, of Boston, U. S. A., in which he alleged that electric energy was obtained by the direct combustion of carbon dipped in a bath of fused caustic soda. We mentioned at that time that Mr. C. J. Reed, an investigator who has specially devoted himself to this field of study, considered that there was no such thing as combustion of carbon or anything else inside the cell, but that the so-called galvanic battery consuming carbon was merely a thermo-electric generator, deriving its electro-motive force from the difference of temperature of the junctions of the fused soda with the carbon and iron.

Mr. Reed has since that time made a series of experiments, which leave no doubt that his theory of the Jacques generator was the right one. This might have been inferred from the comparatively ancient experiments of Andrews, Hankel, and others which we quoted. Jablochkoff made a battery to all intents and purposes identical with this (see *Electrical Review*, page 292, December 1, 1877); but as there still appears to be a belief abroad, even among scientific men, that Dr. Jacques has at last caught this *ignis fatuus* of the electrician, we think it advisable to give some account of Mr. Reed's experiments, so that this startling invention may, like so many of its predecessors, be consigned, once for all, to the limbo of stillborn projects.

Mr. Reed made three experiments to determine whether or not the action of this generator was thermo-electric. A quantity of caustic soda was placed in a sheet iron cup, with a long, iron handle, connected by a wire to one terminal of a voltmeter. The other terminal of the voltmeter was connected by a flexible wire to a conducting rod, which could thus be dipped when necessary into the cup. The cup was then heated by a Bunsen burner, and readings were taken by dipping the rod into the caustic soda at intervals of about one minute from the time the alkali fused till the highest attainable temperature was reached.

Rods of carbon, nickel, copper, iron, German silver, lead, and cadmium, were used. They all gave electro-motive force curves of the same general shape as the temperature increased. The electro-motive forces were at first positive, but a change from positive to negative took place a little below red heat—a change which is in accordance with the thermo-electric behavior of substances generally, but can not be reconciled with any rational theory of galvanic or chemical action. A careful examination of the carbon rod, before and after the experiment, and also after prolonged use in other experiments, showed not the slightest indication of any change such as combustion would produce. The maximum electro-motive force obtained from some of the metals was notably greater than that obtained from carbon.

In order to make a comparison of different materials under as nearly as possible the same conditions, another experiment was made. Three rods, one of carbon, one of copper, and one of iron, were insulated by sheet asbestos and held close together in a vertical position by a suitable clamp, and the lower ends of the rod were dipped in the fused alkali. By means of a suitable switch, these three rods could be rapidly connected in succession to the voltmeter. The temperature of the alkali was gradually raised, as in the former experiment. The experiment showed that the highest electro-motive force was produced with the iron rod, which, at a certain temperature below red heat, gave 1.15 volts. This is a remarkably high voltage for any thermo-electric couple, especially when we consider that it must be due to the comparatively small difference of temperature between the junction of the fused alkali with the pot and its junction with the iron rod. The maximum electro-motive force obtained with the carbon rod was 0.65 volt.

The blast of air used by Dr. Jacques merely served to increase difference of temperature between the two junctions, for Mr. Reed found that a jet of coal gas had exactly the same effect as the air; so that the chemical action of the oxygen of the air on the carbon could not possibly have had anything to do with it.

In Mr. Reed's third experiment, a long piece of iron gas pipe, bent into the form of a V, was substituted for the rods. A blast of cold air was continually blown through the pipe. The highest electro-motive force attained in this case was .94 volt. In this experiment, and in the previous one, the iron rod, or pipe, remained positive to the cup, while in the first experiment the iron rod became negative at a high temperature.

These experiments of Mr. Reed appear to leave no opening for the view that the electric energy of the Jacques generator is derived from the chemical combustion of the carbon in the cell. The energy of the Jacques generator is, therefore, entirely derived from the combustion of the fuel consumed outside the generator, to maintain the alkali in the fused condition, and supply the heat lost by radiation and absorbed at the junctions by the Peltier effect; and Dr. Jacques thought fit to neglect the cost of this fuel in the calculation of the 82 per cent efficiency of his generator. Such neglect is characteristic of the enthusiastic or ignorant inventor who can see nothing that tells against his pet idea, but does not say much for the scientific training and scientific spirit in America.

But not American doctors alone appear to have been taken in by this plausible idea. On this side we have recently had a protest in a letter to the *Liverpool Post* from Mr. M. Whitley Williams, late professor of chemistry, Queenwood College, Hants, against giving the credit to an American of so great a discovery as the direct conversion of carbon into electrical energy. He alleges that in 1885 he made the Jacques experiment, and obtained a powerful current by dipping ignited carbon into a mass of oxidized alkaline salt. Mr. Reed's experiments will now convince Mr. Whitley Williams that he would have got an equally good, if not a better, result by using iron instead of carbon, and that no such thing as a useful combustion of carbon takes place. Mr. Williams winds up with an appeal to Britain to value her own inventive sons, and to distinguish and foster them. The occasion for this appeal is, in the present case, unfortunate, and he may for once be willing to let America have all the credit.

It is no objection to Dr. Jacques's invention that it is a thermo-electric generator, except that hitherto thermo-electric generators have shown a remarkably low efficiency. Instead of 82 per cent, which the calculations give on the assumption that the generator is a galvanic battery, as a thermo-electric generator the efficiency is more probably less than one per cent. However, the elements of the thermo-couple are rather unusual, and it is just possible that the efficiency may be somewhat higher. It is to be hoped that, at least as a matter of scientific interest, some accurate tests of the generator will be made, in which the fuel consumed in heating the pot is not neglected.

A scheme for sterilizing water by electricity is to be tried in Paris on a large scale.

The Russian Washerwoman, the Needle and the Magnet.

A washerwoman in St. Petersburg ran a broken needle into her hand, and was unable to extract it, says an exchange. After two months, when the hand had become so inflamed and painful as to be useless, she called in her doctor. He immediately said it was no case for him, but for an electrician. The electrician was sent for, and the hand of the woman was placed on the pole of a weak electro-magnet, which was excited by three cells. The object was to draw the needle out, point first and by degrees. Accordingly, the experiment was repeated day after day for an hour or two at a time, the current being interrupted so as to urge the needle forward. At the end of nine days it issued from the skin, without the loss of a drop of blood, and stuck to the magnet. The current acted for 20 hours altogether, and there was little or no pain. It may be noted that the electro-magnet is now an indispensable part of the equipment of the oculist, by whom it is used for the extraction of metallic substances from the eye.

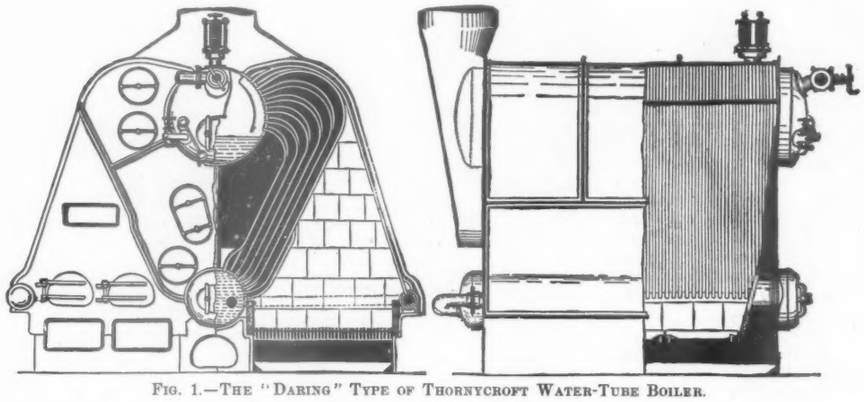


Fig. 1.—The "Daring" Type of Thornycroft Water-Tube Boiler.

OUR CANADIAN LETTER.

Nauaimo, B. C.—The City Council have decided to expend $3,000 for a new electric fire-alarm system.

Huntsville, Ont.—Tenders for the installation of an electric lighting plant are being received by the Village Clerk.

Niagara Falls, Ont.—It is the intention of the directors of the Niagara Falls Park and River Railway Company to extend the road.

Three Rivers, Que.—The North Shore Power Company is being incorporated as an electric power and light company, with headquarters at Three Rivers, for the purpose of supplying electricity for light, heat and power to operate the tramways.

Montreal, Que.—Messrs. Hogg & Morgan, of this city, are busily engaged in attending to expropriations at Longue Pointe, connected with the construction of the Chateauguay & Northern Railroad. The arbitrators are Messrs. Bordie, for the company; J. P. B. Casgrain, for the proprietors, and Mr. Louis Allard as third arbitrator. J. A. C.

Montreal, October 5.

The Thornycroft Water-Tube Boiler and Feed-Water Regulator.

After having made for itself a great reputation in Europe, the Thornycroft water-tube boiler is about to be introduced in this country.

It possesses a great many features of interest, and the qualities claimed for it should receive special consideration from those having charge of the designing of electric lighting plants.

The accompanying illustration shows the type of boiler known as the "Daring," by reason of its first having been used in a British war boat of that name. It will be observed that the upper ends of the steam generating tubes terminate above the water-line; they can not become choked by dirt or scale, a risk which is always present with water-tube boilers in which the tubes end below the water-line.

The course of the gases is between two complete walls of tubes, in which are other tubes, so that by the time the gases reach the stack they are reduced in temperature to a figure found to be as low as any recorded. It is claimed that the boilers are by far the safest known, for if, by long usage, a tube should give way, the damage to life and property must necessarily be less than with the ordinary water-tube boilers, in which the steam-generating tubes discharge their contents below the water-line.

The boilers are adapted for steam pressures up to 300 pounds per square inch, or more. They are built with very roomy fire-boxes and are very easy to stoke. They do not prime, and, in fact, with the Thornycroft automatic feed-water regulator gear, are exceptionally easy to manage. The steam pressure can be increased without inducing leakage or priming, and quickly lowered without the boilers giving any trouble.

The following extract from the official report of the trial of a cruiser illustrates this:

"During the trials the boilers worked most excellently. Steam was kept up with the greatest ease. The steam-generating power could be regulated nearly immediately to suit the steam consumption of the engines by the means of the stop valves on the steam pipes of the fans. At the end of the sea speed trial, for instance, we forced the engines up to 3,314 indicated horse-power in a few moments, after having steamed over seven and one-half hours with an air pressure of about 0.6 inch, and could keep the steam at this high horse-power with an air pressure of about one inch.

"When going full speed we often stopped the ship immediately, and we could bring the ship up to full speed in a few minutes, it being not necessary to take any regard whatever to the boilers, these being able to stand all sudden changes of temperature.

"The boilers never primed, neither during the highest forcing nor during sudden changes in the working of the engines."

The weight of these boilers is claimed to be less than that of any other type, and the space occupied by them is small.

The circulation in the Thornycroft boiler is very rapid, and the design will show that it must always be in the same direction. The bent tubes can never act as down comers, as they deliver above the water-line. The down comers are large and are in the coolest part of the boiler.

Professor Kennedy, the well known English expert, reported as follows concerning these boilers.

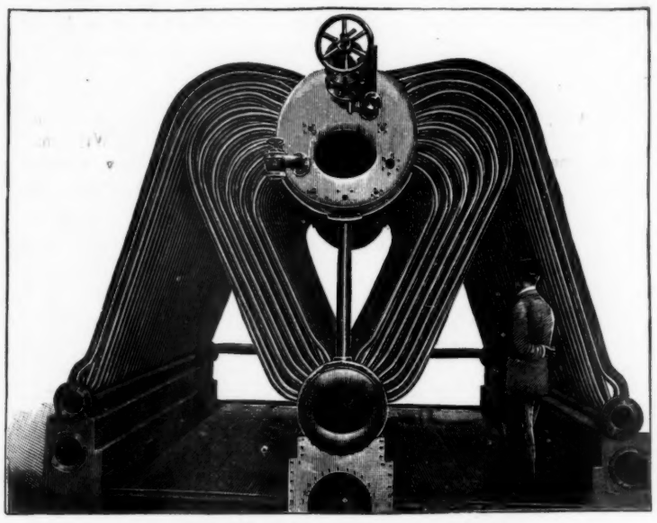


FIG. 2.—THE THORNYCROFT WATER-TUBE BOILER.

"It is only right that I should say that this is the highest boiler efficiency I have ever found upon any trial with which I have had to do, if, indeed, it be not, as I almost think it is, the highest on record in any trustworthy manner."

Messrs. Thornycroft being shipbuilders, the boilers so far have been used mostly for marine service. They are to be found in the navys of Great Britain, India, France, Germany, Denmark, Austria, Spain, Italy, Argentine Republic and Brazil. The United States torpedo boats, "Cushing" and "Ericsson," are fitted with boilers built under Thornycroft patents.

The actual working of the Thornycroft feed-water regulator has proved eminently satisfactory, and the regulators have been placed, by order of the British Admiralty, upon several types of water-tube boilers, and also upon the largest Scotch boilers.

Where several boilers are fed by a pump common to all, considerable difficulty is often experienced in regulating the admission of feed-water. A little extra steam pressure, or a very slight difference in the adjustment of the feed check valves, may prevent a boiler from getting so much water as its fellows.

This difficulty is partly overcome by fitting a separate pump to each boiler, but if the supply is practically limited (as is usual on steam vessels) to the water condensed from the main engines, a very slight fall or rise in the gauge glasses of the majority of the boilers may result in a considerable fluctuation of the water level in the remaining ones.

This has often proved a great objection to the use of boilers grouped as described, and many have been the attempts which inventors have made to satisfy the demand for a trustworthy apparatus capable of automatically regulating the admission of feed-water. Almost all, however, though working well when nicely adjusted, depend upon some spring or other delicate fitting which can easily get out of adjustment. Moreover, they have moving parts passing through stuffing boxes, and the first time the packing is tightened, such gears are at once rendered useless, or worse than useless, by the increased friction which the float has to overcome.

Finding there was no apparatus of this kind which could be understood by an ordinary workman, and be depended upon not to get out of order, Mr. Thornycroft designed one for use on the vessels constructed by his firm, and in which from three to eight boilers are fed from a single feed pump.

FIG. 3.—THE THORNYCROFT FEED-WATER REGULATOR.

Its principle is similar to that of an ordinary ball cock, such as is used on house cisterns. A float formed of solid drawn steel causes a lever to rise and fall with the water level, and so to open or shut a valve, placed inside the boiler, which controls the admission of feed-water. Neither of the two parts moved by this float lever passes through stuffing boxes (by which their action might be hampered), but they are loosely fitted, and hence work with perfect freedom and certainty.

The important novelty in this invention is the method adopted for enabling the float (and therefore the water level) to be adjusted to stand at a definite height, although the amount of valve opening required to admit sufficient feed-water varies with different rates of steaming. This is done by adjusting either the vertical position of the fulcrum of the lever or by altering the length of the connection between the lever and the valve.

The former is the method usually adopted, and is managed in a simple way by mounting the fulcrum of the float lever on one arm of a bell crank, the position of which can be adjusted by a rod which passes through a stuffing box in the front of the boiler, and which is provided with a screwed end. This rod can be moved to and fro by the screwed hub of a hand or chain-wheel. An index, to show the rate of working for which the position of the fulcrum is adjusted, completes the apparatus.

Owing to the feed being continuous instead of intermittent, the feed pipes inside the boiler can often be made smaller where the Thornycroft gear is used.

One result of the adoption of this gear is to reduce the tendency which some boilers have to prime. When a boiler is priming, the gauge glass often shows a false level, and consequent mismanagement of the feed tends to aggravate the trouble. The automaton admits water just when wanted, and not merely when it appears to be required.

As the float can be placed in the center of the water surface, where the motion due to the pitching and rolling of a steam vessel is at a minimum, the Thornycroft gear is said to be much steadier in its action than can be the case with the other types in the market, in which a float is contained in a chamber external to the boiler, even when their glands, springs, etc., happen to be in perfect order.

Messrs. Thornycroft's interests in the United States are now in the hands of Messrs. Thorpe, Platt & Company, 97 Cedar street, New York city, who, we understand, are prepared to grant licenses for manufacture.

The Southern New England Telephone Company's Underground Work.

A telephone friend writes from New Haven, in regard to setting poles and stringing wires for telephone companies, that the charter granted to the Southern New England Telephone Company gives that company the right to occupy any city or highway with poles and underground conduits, subject to location by the county commissioners. The cities, boroughs and towns in Connecticut have no right to give or refuse permission to any company to set poles on the streets. The Southern New England Telephone Company is just now starting at Bridgeport, as well as in New Haven and Hartford, to complete underground distribution.

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ASSOCIATE EDITOR:
STEPHEN L. COLES.

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Just glance through the ELECTRICAL REVIEW if you imagine the electrical field is not wide-awake.

The local street railway men, St. Louis, will extend a cordial welcome to the visiting brethren next week. This fine city is noted for its hospitality.

There are quite a number of big contracts for electrical goods pending, among them the New York, New Haven & Hartford, Manhattan and the Metropolitan Traction. All of these are likely to be placed within the year if the result of the election assures sound money.

Great credit is due to the Electric Storage Battery Company, of Philadelphia, for their enterprise and boldness in putting to severe practical test electric storage batteries as the important part of the electrical equipment now being experimented with on the elevated railroad in New York city.

The advertising pages of this issue of the ELECTRICAL REVIEW present incontrovertible evidence that the manufacturers and business men of the electrical field have a strong and abiding faith in the future prosperity and strength of this country. The man who bids for business now will gain a wonderful advantage over his ultra-conservative contemporaries.

A representative of one of the largest dealers in copper in the world reported to the ELECTRICAL REVIEW last week that a very large number of orders were waiting to be placed, and would probably be given out within a few days. An unusually large number of buyers are in New York at the present time, which fact is regarded as a very encouraging sign.

The conclusion of Dr. Louis Duncan's interesting presidential address to the American Institute of Electrical Engineers is published in this issue of the ELECTRICAL REVIEW. In it he gives some very clear expositions of important questions relating to the distribution and transmission of electrical energy. The careful reader will gather from Dr. Duncan's address that the question of feasibility being settled, the first important matter to be decided is the proper location of the generating station, and that it is better to expend brain work on this point than to indulge in vexatious worry over problems that may arise only through the wrong location of the power house.

Conservative old London is going ahead of any American city in horseless carriage progress. It is announced that the Road Car Company, which operates 900 omnibuses in London, intends to eventually do away with the use of horses and to run motor omnibuses. It is said that 100 of these new vehicles will be put in service during November and 300 more in January. The business enterprise of New York and the hustle and push of Chicago are thrown in the shade by this project of British enterprise. Where in the world is there a more advantageous field for horseless carriages than the level boulevards and avenues of Chicago or the picturesque park drives of New York city?

THE JACQUES CARBON GENERATOR.

We publish on another page an editorial from our London namesake, in which a rather caustic attack is made on Dr. Jacques, of Boston, and his carbon generator. The claim is made that no chemical action takes place in the generator—that it is simply an aggregation of thermo-electric couples; and, also, that serious omissions have been made in the calculation of the efficiency of the generator. Dr. Jacques, who stands high in the electrical field, had been long at work on his device before it was announced to the world by a too-enterprising newspaper man. Eminent electrical experts have had the apparatus under exhaustive tests and have expressed themselves as astonished and pleased at the satisfactory results achieved. On the other hand, our London contemporary quotes the experiments made by Mr. C. J. Reed, resulting in the negative claims mentioned above. We think Dr. Jacques should, in justice to himself, reply to these criticisms with the results reached under tests already made. These results are known to others, but, under the circumstances, should be given publicity only by Dr. Jacques himself.

BUSINESS IS BETTER.

From the personal observations of the traveling representatives of the ELECTRICAL REVIEW, it is evident that a decided renewal of business confidence has begun, and even the past seven days marks a progressive condition, particularly of the electrical industry. In the New England States the manufacturers of heavy machinery, in a number of specific instances not necessary to mention, are able to show by tangible orders, and perhaps slightly improved prices, that this is a fact. With the supply dealers in that section the demand for construction specialties shows indications of a return to a normal business basis.

We asked about our old friends, the Harrison Telephone Company (capital, $80,000,000), last week. We are answered now that the company has gone into the hands of a receiver. We fear it had too much capital and not enough cash. Neither had it a telephone, but perhaps that was not considered essential, and it now certainly has a "receiver."

The street railway men are progressive. They want to keep abreast of the times. The enterprising exhibitors at the Street Railway Convention next week, we predict, will be well repaid for their trouble and expense in presenting to this important branch their various products.

THE FINANCIAL SIDE.

The stock market had a moderate reaction this week, largely the result of sentiment. The word went forth from Republican political headquarters a week ago that the sound money advocates were becoming over-confident and that they must do more work and less bragging. This was followed by a general secession of stock buying and later by moderate realizing. Tighter money and the disposition of the banks to trim their sails assisted the reaction. Professional traders were for the most part either on the short side of the market or had previously taken profits so that they did not oppose lower values. The most favorable development of the week was the purchase of something like $6,500,000 gold abroad for import into this country. Business interests throughout are a shade more confident, and while the majority still prefers not to make any extension or expansion until after election, a number are beginning to take advantage of the low prices now, considering them of sufficient inducement to gamble upon the result. Commercial interests are forced to pay a little more for money than last week, but those that are deserving have no difficulty in securing accommodations.

Several manufacturers of electrical apparatus with whom I talked say that they are doing very little. Their work consists largely of completing contracts on hand and in making stock goods. They are promised an abundance of orders provided McKinley is elected. The number of inquiries and projects from street railway enterprises that are in the field are said to be larger than at any time in several years.

The active electrical securities reflected the general decline. General Electric went off from 28 to 25, Western Union from 83½ to 81⅞. In Boston, Bell Telephone closed the week at a loss of 1 per cent, being 203 bid and 204 asked. Erie Telephone gained 1¼ ending at 59. New England Telephone advanced 2 to 92. General Electric preferred opened at 64 bid, 65 asked, and closed 60 bid and 62 asked. In Philadelphia, Electric Storage Battery common and preferred each lost 2 points, closing at 27½ and 28, respectively. Pennsylvania Heat, Light and Power lost a large fraction, closing at 12½.

I am told that absolutely no move has been made looking towards a readjustment of the claims of the General Electric preferred shareholders. Interest due on this stock amounts to 21 per cent. If this is deducted from the current bid price of 60 it will be seen that the stock has but a comparatively small value over that of the common shares.

The only development of interest in New York traction matters this week was the report that Metropolitan Traction Company or some of its capitalists had become financially interested in Manhattan and proposed to back a construction company having a capital of $25,000,000, with a view of electrically equipping the Manhattan road. Electrical men say that this story was put out to advance the price of the stock. They admit that the Manhattan company has done some figuring on electrical equipment, but say that it is not in possession of data sufficiently exact to warrant any such move as the one noted. As for the battery operations on the Thirty-fourth street branch, they say that there is a motive other than to obtain a cheap and adequate service for the entire system.

I had a talk with one of the most prominent experts on unlisted securities recently. Referring to the great mass of unlisted securities, including those of the telephone, telegraph, railroad and lighting systems, he says that values are comparatively low, and afford a very good field for investment. This is particularly true of street railway stocks. The mass of securities of this class did not seem to have as serious a decline as those listed on the Stock Exchange for the reason that they are seldom carried on margin. He looks for a steady recovery from the low point of mid-Summer. BAIN.

New York, October 10.

The Brooklyn Heights Railroad Company.

The annual report of the Brooklyn Heights Railroad Company, of Brooklyn, N. Y., recently filed with the Railroad Commission at Albany, N. Y., shows the following additions and betterments on leased lines during the past fiscal year:

Track and roadway construction, $361,839; overhead construction, $84,939; engineering, $7,268; buildings and fixtures, $115,081; miscellaneous equipment (motors, trucks, armatures, controllers, etc.), $202,449; car equipment, $37,493; power station equipment, $4,780; miscellaneous, $62,289, making a total expenditure on account of the lessor road (the Brooklyn City Railroad Company) during the year of $876,142.

The total amount to June 30, 1896, of money advanced by the Heights company for reconstruction and extensions of the Brooklyn City Railroad Company was $2,821,704. This amount, with additions hereafter made, is, under the terms of the lease, to be reimbursed to the Heights company at the termination of the lease.

The number of passengers carried during the year was 106,686,306, as against 100,879,646 during the preceding year. The total amount paid in wages was $2,022,466.

Through special arrangements made by the Long-Distance Telephone Company, the music, cheers and other noises attendant upon the monster sound-money parade in Chicago on October 9 were heard at Republican headquarters in New York city. A huge megaphone attached to the front of a building in Chicago was used to catch the sounds, which then followed the wires over the usual route. Connections were also made so that Major McKinley heard the noises at his home in Canton.

An Interesting View of the Sound-Money Question.

Mr. Charles M. Jarvis, the president and chief engineer of the Berlin Iron Bridge Company, of East Berlin, Ct., writes the following timely communication to the *Press*, of this city, under date of October 8.

The Berlin Iron Bridge Company, of East Berlin, Ct., have received from their representative at Cerro Lerdo, Mexico, the contract for an iron market house at Guadalajara. If this market house were built anywhere in the United States, and paid for in our money, the contract price would be $5,615. The Berlin company are, however, to receive in payment for this building Mexican silver dollars, and therefore their contract price with the city of Guadalajara is $11,230.

If Mr. Bryan and his Populistic platform should prevail, and there should be free coinage of silver on the basis of 16 to 1, what is to prevent the Berlin Iron Bridge Company from taking the dollars which they receive in payment on this building, each one of which contains more silver than the American dollar, to a United States mint, and, free of expense, have them coined into American silver dollars? Under free silver they will then receive for their building 11,230 Bryan dollars, which he claims will be worth as much as gold dollars, consequently they can be used in paying the employés, thus leaving the company a clear profit of over $5,000 on this one contract.

Or, again, they can take these same 11,230 standard silver dollars, and with these pay the labor and expense of building another market house, another bridge or building for the Mexican market, and receive for the same 22,460 Mexican dollars. They can then recoin these free of expense into American dollars, and thus by each transaction double their money. Does any laboring man in this country believe that labor paid for in money of that kind will have the purchasing power of our present dollar? Would there be any difference in paying labor in those dollars or in reducing the present rate of wages 50 per cent? Who, under the circumstances, will be benefited by free coinage—capital or labor?

Engineers in Brooklyn, N. Y., Organize.

An Engineers and Architects' Association has been organized in Brooklyn, N. Y., and all civil, mechanical, naval, military, electric and mining engineers are eligible for membership. In the Brooklyn library an alcove with several thousand books of reference has been set apart for the use of the association. A. J. Provost is temporary chairman of the organization, and the committee which has been appointed to draft a constitution and by-laws includes Mr. Provost, William G. Ford, Walter Meserole, A. J. Caldwell and George W. Wilson.

The use of mail cars on street railroads is becoming quite common in many of the larger cities. The street railroads extend in every direction, and it is found by experience that by running mail cars over the various routes the collection of the mail is greatly facilitated. The mail is first gathered by foot collectors and put in station boxes, from which it is taken when the cars come along.

PERSONAL.

Col. S. G. Booker, of the Phœnix Carbon Manufacturing Company, St Louis, was a recent visitor to New York city.

Mr. E. H. Heinrichs, of the Westinghouse Electric and Manufacturing Company, Pittsburgh, was among the out-of-town visitors to New York last week.

Messrs. Henry Hine and Wm. Stanley, Jr., of the Stanley Electric Manufacturing Company, Pittsfield, Mass., were among the visitors to New York city last week.

Mr. John F. Outwater, representing Hugo Reisinger, 38 Beaver street, New York city, importer of the Nürnberg Electra carbons, is making an extended business trip through the West.

Mr. Allen R. Foote, editor of the *American Exporter*, is sending out sound-money literature to the gas, electric lighting and street railway companies in several of the doubtful States.

Mr. C. E. Trump, president of the Novelty Electric Company, Philadelphia, made a brief visit to the metropolis last week. Mr. Trump has fortified himself against the Fall campaign by a pleasant fishing trip through the Rangely Lakes, and is strong enough to handle any order for his firm's well known goods.

Mr. Edward P. Thompson, of this city, who is the author of a new book, "Roentgen Rays and Phenomena of the Anode and Cathode," sent a copy to Professor Roentgen and received the following reply: "My Dear Sir: I express to you my sincere thanks for kindly sending me your book, 'X rays,' which I have read with great interest. Yours very truly,

DR. W. C. ROENTGEN."

On Wednesday, October 7, 1896, at "Clover Nook," Scarsdale, N. Y., Mr. James Rich Steers was married to Miss Mary Dolores Beales, daughter of Mrs. James A. G. Beales and granddaughter of the late Eugene Kelly. Owing to the illness of Mrs. Beales, the wedding ceremony was held at the home of the bride, in a quite manner, none but members of the family being present. Mr. Steers has been connected with the electrical business for some years, starting with the Interior Conduit and Insulation Company, of New York, and is now the partner of Mr. A. K. Warren, of electrical repair fame, trading under the old name of A. K. Warren & Company. Mr. Steers has also the distinction of being a nephew of James Steers, the builder of the racing yacht "America."

The great illustrated humorous weekly, *Judge*, is the foremost publication of its kind in the world. Its color work is particularly effective and its artistic efforts are of a noticeably high order. The current issue presents a colored front page, picturing the Democratic candidate chasing the butterfly of a presidential nomination. This illustration is an unusually striking one.

PRESENT STATUS OF THE DISTRIBUTION AND TRANSMISSION OF ELECTRICAL ENERGY.

BY LOUIS DUNCAN, PRESIDENT AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, SEPT. 23, 1896.

(*Concluded from page 178.*)

If any transforming device is employed to feed a distant section of the line, it must be remembered that the capacity of the device must be great enough to look out for the maximum demand on this section. Suppose now that we wish to feed some suburban line where the load has considerable momentary fluctuations, but where the traffic is moderately constant during the year. In this case the booster could be used with a storage battery at the end of its feeder, the battery supplying the line. The advantages of this combination are greater than with the simple booster, and in many cases they will compensate for the interest and depreciation on the battery and the loss in it. If the arrangement is properly made, the load on the booster and line wire will be practically constant, thus decreasing the capacity of the booster to that required for the average load, while less copper will be required for a given loss. As to the latter point, suppose a given amount of power is to be distributed in 24 hours, say 200 amperes at 600 volts; if the load is uniform, the loss will be proportional to $200^2 \times 24$ hours. If it is all distributed in 12 hours, the loss will be proportional to $400^2 \times 12$ hours, or twice as much. So in the case of the steady load the same power could be transmitted with the same loss with half the copper. It makes no difference whether the variation extends over 12 hours in 24 or it occurs every other minute, the result will be the same. It is apparent then that it is of the utmost importance to keep the line steadily loaded, as well as the station, and this points to the location of the battery near the points of consumption and not in the station. By this system—a booster with storage batteries—it is possible, assuming the same loss, to transmit power to a distance of 10 miles with approximately the same amount of copper that would be required for a five-mile transmission on the direct system. It would increase the economical radius of distribution twice, and the area of distribution four times. A single station could economically supply lines within distances up to 10 or 12 miles. If it is desired to still further increase the radius of distribution, it is possible to do this by employing some of the alternating-current methods that have come into use. I will discuss these methods later, but at this point I may remark that the use of stationary and rotary transformers permits the energy to be transmitted in the form of alternating currents, and to be changed again into continuous currents of any required voltage. These rotary transformers, supplied by an alternating current which is transmitted from the station at a high voltage, may be used to feed the line directly, or they may be used to supply storage batteries which are connected to the line. In the latter case we have the advantage of decreased size of apparatus, of steady load on the station, and of a minimum cost of copper on the line; which system it would be best to employ would depend upon the distances and the character of the line and load.

Of the systems that I have proposed for city and suburban distribution from a single station, three have been successfully employed; namely, the booster system—the booster system with batteries and rotary transformers operating directly on the line. When we consider the advantages of a single station and a steady load, it seems evident to me that many of the large traction systems would do well to concentrate their stations into one, and to use the booster system with batteries for their outlying lines, and, if necessary, use rotary transformers for lines beyond the limit of ordinary suburban work. As to the possibility of the complete shut-down of such a station, we have reached such a point in the construction of machinery, both electric and mechanical, that with a proper reserve, a careful system of duplex steam piping and with fireproof construction of the station, such a possibility may be disregarded, while the batteries would look out for any momentary interruption on the feeders.

CONTINUOUS-CURRENT, LOW-VOLTAGE DISTRIBUTION.

Some of the most important stations supplying incandescent lamps are operated on the three-wire, continuous-current system. In the last few years a considerable advance has been made in the sale of power for motors from these stations, and this has increased the revenue and has given better average output. The tendency in this country has been in the direction of using storage batteries in such stations, and abroad practically every continuous-current station uses batteries. As in the case of traction systems, it has been the custom in large cities to build a number of separate stations instead of building a single plant and distributing from it. The batteries have been placed in the stations themselves, and no attempt has been made to decrease the amount of copper used by employing a number of centers of distribution and giving the main feeders a steady load. The same considerations that apply to stations for traction work will also apply to stations used to supply lights, and the same methods of distribution may be used. It would unquestionably be more economical, in many instances, to use single stations, to transmit power from these stations to centers of distribution, where batteries may be located, and to distribute from these centers on a three-wire system. A case in point is the system used at Buda-Pesth, where the energy is distributed from the central station to rotary transformers at sub-stations, these rotary transformers feeding batteries, current being distributed from these batteries on a three-wire system. The reports of the operation of this station show that it is both economical and successful, and it might well be copied by some of the companies in this country. The gross receipts of some of the large illuminating companies bear such a large proportion to the company's stock, that a comparatively small saving in operation would mean a considerable increase in the dividends, and there is no doubt in my mind that by using one power station, with battery substations for distribution, the operating expenses can be considerably decreased.

ALTERNATING CURRENTS FOR LIGHTING.

Alternating currents have been employed for lighting in this country, and they have been especially valuable where a district is to be supplied in which the distances are considerable as compared with a number of customers. It has been almost the universal custom to supply small transformers for each consumer, and while the average size of transformers is greater now than it was a few years ago, yet they are comparatively small. No power has been supplied from such stations, and although alternating arc lamps are used to a limited extent, yet the number is not increasing, and in some cases continuous current arc lamps have been substituted for the alternating. Under these conditions the load on the station is even more variable than in the case of a continuous-current supply where motors may be employed, and the constant loss, due to the large number of small transformers used, places this system at a disadvantage as compared with the continuous-current system. The great advantage it possesses lies in the increased area of distribution rendered possible by the high voltages that are used, together with the possibility of locating the stations where power can be cheaply made. Abroad, in the last few years, most of the new stations that have been built use continuous currents, although some years ago the greater proportion of them were alternating-current stations. It is also the custom abroad to use sub-stations with large transformers for distribution, thus doing away with a considerable part of the constant loss due to the small transformers used here. It is not possible, at the present time, without greatly complicating the system, to obtain a steady load on the station, and the only question that arises is the value of sub-stations, and the possibility of using some form of alternating current other than the single-phase.

METHODS OF ELECTRICAL TRANSMISSION.

Coming to the question of transmission of electrical energy as distinguished from the supply to customers from distributing centers, there have been great advances made in the last few years, and these mainly through the introduction of multiphase alternating currents. Single-phase alternating currents permit the transmission of power to long distances and its distribution for lighting purposes. It is also possible to supply power from such circuits to large motors working under a steady load. It is not possible, however, to distribute power economically for ordinary uses. As most long distance transmission schemes contemplate the substitution of electric motors for steam engines, and as their success will, in many cases, depend upon the possibility of such substitution, single-phase alternating currents are not at present able to comply with the conditions imposed by the desired service. The introduction of multiphase alternating systems, where two or more alternating currents are employed, the currents differing in phase, has completely changed the situation with respect to long distance transmission. I shall consider briefly the possibilities of such systems and their value as compared with any direct-current system.

CONTINUOUS-CURRENT TRANSMISSION.

The first long-distance transmission plant was operated by the continuous-current system, and even now plants are being built in which continuous currents of high potential are used to transmit energy to distances up to 15 miles. As compared with transmission by means of alternating currents, we will find that the continuous current system possesses some advantages and some disadvantages. If we consider the relative cost of the copper in the line for a given amount of power transmitted and for a given maximum potential between the conductors, we will find that the relative amounts for the continuous current and the different alternating-current systems will be as follows:

Continuous current	100
Single-phase alternating	200
Two-phase "	200
Three-phase "	150

We see then that the continuous current has a marked advantage over the alternating current systems as far as the cost of copper is concerned. There are, however, certain practical disadvantages belonging to this system. The high voltages necessary for long-distance transmission make it impossible to distribute the current at the receiving end without first reducing the voltage. With continuous current this can only be done by employing a rotary commutator of some kind. A plan which has been practically and successfully used has been to run a number of dynamos in series at the generating end of a line, while at the receiving end are a number of motors, also arranged in series, which are used to drive other generators to give the required type of current and the desired voltage. It has not been found possible to make either dynamos or motors of any great output, as there are practical difficulties in running dynamos of high potential where the current taken from them has a considerable value. M. Thury has installed a number of continuous-current transmission plants that have apparently given excellent results. At Biberist, a transmission of 15 miles is employed. At Brescia, 700 horse-power are transmitted over 12 miles at a maximum of 15,000 volts. M. Thury states that generators for 45 amperes can be constructed up to 3,000 volts, and he thinks that 4,000 could be successfully used. These machines, however, are small when compared with the 5,000 horse-power dynamos in use at Niagara, for instance, and where the transmission is a large one, the great number of machines necessary would be a serious objection to this type of transmission. It will be seen that the greatest possibility of trouble, in such a transmission, lies at the ends of the line, in the generating and receiving apparatus. It is necessary, no matter what our voltage is, that both the dynamos and motors shall be directly subjected to it, and this with commutated machines will always be a source of danger. If we are to do any considerable amount of lighting from such a station, our energy for this purpose undergoes three transformations before it reaches the lamps, and the efficiency would not be so high as in a corresponding alternating-current system. It would hardly be possible to supply motors for ordinary work at the high voltages used for transmission, and the current for them would have to be transformed in the same manner as the current for the lamps. It must be recognized, however, that this system has been successfully used and has given excellent results in a few cases of transmission. Its great advantage lies in the decreased amount of copper as compared with the alternating systems, and in the absence of induction effects, which are a drawback to alternating-current transmission.

TRANSMISSION BY ALTERNATING CURRENTS.

A large proportion of the transmission plants that have been installed in the last few years have been of the alternating-current type. These have, as a rule, given satisfactory results, and the installations that are now being erected or planned are almost exclusively on an alternating-current basis. The great advantage of this system lies in the fact that it is possible to change the volt-

age of the current without the use of rotating apparatus, and at once economically and safely. Low-voltage dynamos may be used, the voltage may be increased in any desired ratio by stationary transformers, the energy may be transmitted at an increased voltage, and at the receiving end the voltage may again be reduced by transformers. If we compare this method with the continuous-current system, we will see that to obtain an alternating current of the required pressure at the receiving end of the line, we would use the same number of transformations required by the continuous-current system. We have the great advantage, however, that our changes in voltage have been obtained by the agency of stationary apparatus, which is much cheaper, is more efficient and is safer than that required in the continuous-current system. It is possible to increase the voltage, by means of transformers, to almost any value with perfect safety, and with an efficiency as high as 98 per cent or 99 per cent. If, then, our alternating current, when it has been reduced at the receiving end, is as valuable for distribution as the current obtained by the direct-current system, there will be no doubt that alternating transmission has great advantages over continuous currents.

I have spoken of the relative amounts of copper required by the single-phase, two-phase and three-phase alternating currents. I do not think it necessary to explain minutely the difference between these systems, as they are well understood. In a single-phase system a single alternating current is used. In a two-phase system two alternating currents, whose phases differ by 90 degrees, are employed, while in the three-phase system there are three currents differing in phases by 60 degrees. I shall consider the characteristics of these three systems, as there has been much discussion, especially as to the relative value of the last two of them for transmission work. I shall not discuss the various modifications of the systems but shall confine myself to general considerations. There is no single-phase motor in successful commerical operation that does not require to be started from rest by some outside means. This prevents a single-phase current from being used at the present time for power distribution; and, as in most transmission, the distribution of power is an important item, single-phase currents are not suitable for this purpose. In a two-phase system the currents are usually carried on separate pairs of wires, while in the three-phase system three wires are generally used, a common return being unnecessary, as the sum of the currents is zero, unless the circuits are unbalanced. In distributing on the three-phase system, a fourth wire can be employed, as it gives an advantage in the amount of copper used.

In all these alternating systems the great difficulty lies in the fact that the inductance of the circuit causes the current to lag behind the electromotive force. This decreases the amount of energy transmitted by a given current at a given voltage; it causes a drop in the voltage of the line, and it increases the armature reaction of the dynamo for a given current. The total inductance of the circuit is made up of the inductance of the transformers, of the dynamos, of the receiving apparatus and of the line. In the case of transmission to very long distances, the line inductance is a large proportion of the total, while the inductance of the receiving apparatus depends upon whether lights or motors are to be supplied and upon the construction of the latter. When the different wires of the multiphase system are fed from windings on the same dynamo armature, then the drop in voltage, due to any excess of load on one of these circuits, can not be compensated for on the dynamo itself. If the amount of current and the lag of the current are the same for all of the circuits of the system, then it is easy by a compounding winding of the dynamo, or by changing the current in the field winding, if there is no compounding, to keep the voltage constant at either the sending or receiving end. When the load on the different wires of the system is not the same, however, it is, as I have stated, impossible to keep all of the circuits at the proper voltage. Where a two-phase transmission with separate circuits is used, then if the separate circuits are wound on different armatures, each can be regulated to give a constant voltage at the receiving end. This is the case, for instance, in the large dynamos built by the Westinghouse company for use at the World's Fair in Chicago. The difficulty due to the uneven loading of the circuits is specially marked in the case of the three-phase system, and it is one of the principal objections that have been urged against the employment of this system for distribution. It should be pointed out, too, that it is not enough to balance the quantities of current for the three branches of the system, but the character of the current must also be considered. A non-inductive load on one wire, with an inductive load of equal value on the others, would cause an unbalancing just as if the currents differed in amount. In most of the transmission plants that are being operated and that are proposed, it is required to run both lamps and motors from the same circuits, and while a slight variation of potential on the motors would not cause any particular trouble, yet the successful operation of the lamps requires a practically constant voltage. I think, however, and the same grounds have been taken by others, that in any practical transmission of considerable size, it is possible to so balance the loads that this difficulty will not exist to an extent to cause any serious trouble. When the distributing part of the lines is reached it is usually the custom when a three-phase transmission is used to employ four instead of three wires. As for line inductance in the two-phase and three-phase systems, there is no question that the latter has an advantage in this respect. By suitable arrangement of circuits the line inductance can be brought to a minimum, and this is of the utmost importance in long-distance transmission. I will not take into account the supposed increased efficiency of three-phase motors and dynamos as against two-phase apparatus, as there is a question as to whether a superiority exists, but, simply considering the decreased amount of copper required and the decreased inductance of the line, there is no question, in my mind, that, for transmission, the three-phase system is superior to the two-phase. It is well known, of course, that the inductance of the circuit can be, in some measure, compensated for by the use of condensers or over-excited synchronous motors. The first of these remedies is, however, a very uncertain quantity commercially, while the second should be used as much as possible; that is, as many synchronous motors should be connected as is practicable. The best remedy, as things stand at present, lies in the careful construction of the line and the apparatus, so that the effects, although they exist, can be reduced to a minimum.

It has been shown by Mr. Scott and others that it is possible to transform a two-phase into a three-phase current, to transmit it and to transform it back again to a two-phase current. This will allow us, if we wish, to use two-phase dynamos for generating the current, to transmit with the advantage incidental to the use of three-phases and at our reducing end to use two-phase circuits for transmission. This has some advantages, as far as balancing the voltage on the circuits goes, and it has been proposed in the case of several plants whose installation is being considered.

Looking broadly at the value of alternating transmission as against continuous-current transmission, we have a gain in the simplicity and safety in the transmission, and at the distributing end the use of multiphase currents enables us to supply both lamps and power with an economy and success comparable to that of the continuous-current system. If it is necessary to use continuous currents for certain types of distribution at the receiving end, they can be obtained by the use of rotary transformers, by which the alternating current is transformed into a continuous current. These machines have approximately the efficiency of corresponding continuous-current dynamos, while the output for a given size is about 50 per cent greater.

TABLE SHOWING THE PRINCIPAL LONG-DISTANCE ELECTRIC TRANSMISSION PLANTS NOW IN OPERATION.

Name.	Type.	Distance in Miles.	Line Voltage.	Horse Power.	Remarks.
Ouray, Colo.	Direct.	4	800	1200	Successful, increasing.
Geneva, Switzerland	"	20	6600	400	Successful.
San Francisco, Cal	"	12	8000	1000	Successful, 9 years.
Brescia	"	12	15000	700	
Pomona and San Bernardino	Single phase Alt.	13½ to 28¾	1000	800	Successful, increasing 4 years.
Telluride, Colo.	"	3	3000	400	To be increased, 3300 H. P.
Bodie, Colo.	"	12½	3400	150	Successful.
Rome, Italy	"	18	6000	2000	Increasing to 9000 H. P., 3 years.
Davos, Switzerland	"	2	3660	600	Successful.
Schongeisung, Germany	"	4½	2600	820	"
Springfield, Mass.	2-phase Alt.	6½	3600	820	"
Quebec, Canada	"	8	5000	2130	"
Anderson, S. C.	"	8	5500	200	"
Fitchburg, Mass.	"	2¼	2150	400	"
Winooski, Vt.	3-phase.	2½	2500	150	"
Baltic, Ct.	"	5	2500	700	"
St. Hyacinthe, Canada	"	5	2500	600	" 2 years.
Concord, N. H.	"	4	2500	5000	" 2 years.
Fresno, Cal.	"	35	11000	1400	" to be increased.
Big Cottonwood to Salt Lake City, Utah	"	14	10000	1400	"
Lowell, Mass.	"	6 to 15	5500	480	"
Nac amento-Folsom, Cal.	"	24	10000	4000	1 year.
Redlands, Cal.	"	7½	2500	700	3 years, extending lines in other towns.
Lauffen to Frankfort, Ger.	"	100	30000	300	(Experimental.)
Lauffen to Heilbronn	"	9	5000	600	Successful.
Oerlikon Works, Zurich, Switzerland	"	15¾	13000	450	"
Portland, Oregon	"	12	6000	5000	"
Silverton Mine, Colo.	"	4	2500	400	" to be increased.

POSSIBLE VOLTAGES AND DISTANCES OF TRANSMISSION.

A number of calculations have been made as to the possibility of transmitting electrical energy to very long distances. If the question of cost of transmission alone is considered, then where water powers or culm heaps are within distances of 100 miles of some large center of consumption, it has been shown that it would be profitable to generate and transmit electrical energy. In these calculations, however, voltages are assumed that have never been employed for commercial plants, and whose availability is problematic, while sufficient stress is not apparently laid on the question of the reliability of the power. If the industries of a large city depended upon a single transmission plant, it is evident that the question of reliability is of paramount importance. Where energy is supplied to manufacturers, to street-car systems, and for lighting, a break down that would involve the cutting off of current for a day would mean an enormous pecuniary loss to the community. As the distance of transmission increases, the possibility of accident is increased in greater ratio because we have not only the higher voltages to control but the length of the line that must be looked out for is also increased. The best guide lies in the practical experience which has been obtained in the present transmission plants and the consideration of the difficulties that have arisen and the remedies that have been employed. I have prepared a partial list of the principal transmission plants that are now in operation.

It will be seen that the longest transmission is at Fresno, Cal., the distance being about 35 miles. The highest alternating voltage used is 13,000 volts at Zurich, Switzerland. The highest direct potential is 15,000 volts at Brescia.

All of these plants are working successfully and this fact will lead to still longer transmission and higher voltages. No limit of either distance or potential has, as yet, been reached. If we consider the record of the present transmission plants, we can safely say that it would not be going outside of the safe limit of development to transmit at least 50 miles at a potential of 20,000 volts, provided the energy could be delivered at such a price as to be considerably lower than the cost of a corresponding amount of energy obtained from a steam plant. This, of course, is a matter of local condition entirely, and the commercial value of such a transmission will depend upon local conditions.

LONG-DISTANCE TRANSMISSION FOR RAILROAD WORK.

The possibility of long-distance electric railroad lines is intimately connected with the possibility of long-distance transmission of power. We have seen that it is possible to transmit considerable distances from a single station. The current so distributed is not, however, such that it can be applied directly to railroad motors, but it must be transformed at points along the line, the distance apart of these points of distribution depending upon the system that is employed. At present continuous-current motors are used, and considerations of safety would lead us to use line potentials not greater than 700 volts. By distributing rotary transformers at distances of five or six miles apart, we would be able to supply motors with current without any great investment

in copper. The amount of copper required could be still further reduced by using rotary transformers with storage batteries, thus keeping a constant load on the transmission line. It will be found, however, that on any long-distance railroad line, the load on any section of the line is exceedingly variable and the discharge rate of the batteries will have to be very high in order to prevent excessive cost for our reducing stations. It is doubtful whether we have reached a point in battery construction that this system of transmission would be economical. It is certain, however, that, when the distances are comparatively short, say within 15 miles, and where the traffic is not evenly distributed, rotary transformers, with or without batteries, can be economically employed for railroad work.

CONCLUSIONS.

My conclusions, subject always to the influence of local conditions, are as follows:

1. In both direct-current lighting and traction systems, where the power is generated in or near the area of distribution, it is best to use one station situated at the most economical point for producing power.

2. In the case of the traction systems, when the economical area of direct distribution is passed, boosters should be employed directly or in connection with batteries, to a distance of 10 or 12 miles form a station, and beyond this rotary transformers, whether with or without batteries, should be used.

3. In the case of direct-current lighting systems, the energy should be transmitted to storage batteries situated at centers of consumption either directly or by means of a rotary transformer and distributed from them.

4. Where batteries are used, it is best to place them at the end of feeder wires to obtain the advantage of a constant load on the wire.

5. The best system for the long-distance transmission of energy, for general purposes, is the three-phase alternating system.

6. Commercial transmissions are in successful operation for distances of 35 miles, and for voltages as high as 15,000 volts.

Experience with these plants shows that the transmission to 50 miles, with a pressure of 20,000 volts, is practicable; beyond these limits the transmission would be more or less experimental.

A Busy Company.

The General Incandescent Arc Light Company, Mr. S. Bergmann, president, is engaged in the manufacture of steel pipe for carrying wires for interior work, a very interesting process, and does a large exporting business as well as supplying large users in this country. This is one of the busiest departments in Mr. Bergmann's immense establishment on First avenue and Thirty-third street.

It is from this factory that current is supplied to the Thirty-fourth street elevated for charging the storage batteries now being experimented with at that point. The plant is a very complete and compact one, installed by the Electric Storage Battery Company, of Philadelphia, which company supplies the batteries for the elevated road.

Mr. Bergmann has very large and successful interests in Berlin, from which city he recently returned.

The Danvers, Mass., Electric Light Company is increasing its plant by adding a new engine and 72-inch boiler.

The M. & T. Telephone Apparatus.

The apparatus made by the Murdock & Taber Telephone Company, manufacturers, 185 Franklin street, Boston, Mass., may be of interest to those who desire to see the new telephone apparatus as rapidly as it is constructed. The ELECTRICAL REVIEW shows four types of the instrument herewith. Fig. 1 shows their "pony" vibrating bell set, with a highly polished oak or walnut box with long-distance mouth-piece, and with the M. & T. transmitter mounted on a box with automatic switch. This is the instrument which has been placed in so many of the large establishments in New England for inter-communicating use. It can be used on an inter-communicating system with the battery located at one point by running one additional wire, in which case three or four cells of battery will operate 10 to 25 instruments. Among the list of, perhaps,

FIG. 1.—"M. & T." PONY VIBRATING BELL SET.

FIG. 2.—"M. & T." DESK SET.

30 of the first establishments in New England, furnished to the ELECTRICAL REVIEW, in which installations using these instruments have been placed, it is of interest to mention the following: Offices of the *Youth's Companion*, Keith's new theater, Foster Wharf Company, Fitchburg Railroad Company and Bernstein Electric Company. Fig. 2 is a half-tone of the M. & T. desk set, which is a compact instrument 11 inches high and is particularly well constructed. Fig. 3 shows an M. & T. exchange instrument with long-distance transmitter and automatic switch. Fig. 4 illustrates the M. & T. transmitter mounted with plate on mahogany base, which contains an induction coil. It is a granular carbon, not a "dust" transmitter, and is said to be proof against packing and to transmit clearly.

Telephone Line Construction in the Rocky Mountains.

Telephone construction in the Rocky Mountains is attended with a great deal of hardship. The line built from Leadville to Aspen several years ago is a case in point. It took two months, says the Denver *Field and Farm*, to cover the entire length, 48 miles. In ordinary construction the poles would be set 42 to the mile; but at certain points, where sharp turns are necessary, the number sometimes increased to 75 to the mile. The members of the construction gang had to be expert as axemen as well as linemen; for, when timber was encountered, a path of 200 feet on each side of the line had to be cleared, in order that wires might not be broken when trees were blown

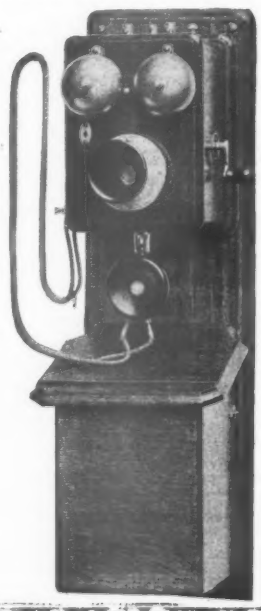


FIG. 3.—"M. & T." EXCHANGE INSTRUMENT.

over by the terrific blasts which at times prevail in that region.

A great deal of the comparative slowness of the installation was owing to the inability of the workmen to labor in such a rarefied atmosphere. At one point the wires were strung at an elevation of 12,000 feet above the level of the sea. In such an altitude the lineman soon became completely tired; after he had climbed two or three poles he had to take a rest to recuperate his energies. The preparation of the holes for poles, which would have been tedious in similar ground, even in an ordinary atmosphere, was an especially slow and fatiguing operation. It was often necessary to blast a hole for the pole by the use of giant powder, and an ex-miner who had had an extensive experience with explosives was assigned to the job.

The digging of one pole hole would sometimes occupy him a whole day. Over 300 pounds of powder were used on the line for this purpose. When the Continental divide was reached the poles had to be abandoned and the wires placed in a cable, which was buried in a two-foot trench for a distance of 7,000 feet. The advisability of abandoning aerial construction at this point was demonstrated by the experience of the company that maintains the Leadville and Denver line. At one point on that line, Mosquito Pass, the poles were originally set 70 feet apart. As soon as the wires were covered with sleet they snapped, and the line was useless. Double the number of poles were then used, with the same result. The space between the poles was then reduced to 25 feet, but when the sleet came the line was swept down flat. Eventually an underground cable was laid for two and a half miles, and there has been no trouble since.

Bristol's Recording Instruments.

Probably the most complete and popular line of recording instruments for pressure, electricity and temperature is that manufactured by the Bristol Company, of Waterbury, Ct. The company has recently issued a list of its recording instruments, which embraces over 100 different varieties. The company is continually making additions to this list to meet all commercial requirements. The demand for such instruments is increasing every day, and the Bristol Company has sold thousands of them. A new catalogue, illustrating in colors the various types of instruments described, has just been prepared by the Bristol Company, and will be sent to any one free on request.

LITERARY.

Every whist-player will want to read the article by Cavendish, the great English whist expert, whose authority is a law unto so many devotees of the game. In "What

FIG. 4.—"M. & T." TRANSMITTER.

America Has Done for Whist," in the November *Scribner's*, he acknowledges that from our side of the water have come several of the leading principles of the modern game. It is a popular paper in every sense.

New York Electrical Society.

The 176th meeting of the society was held at Columbia University, Madison avenue and Forty-ninth street, on October 13, 1896, at 8 P. M. President Emery delivered his inaugural address, entitled, "Reminiscences of Forty Years of Engineering Experience."

Electric Railways.

The Citizens' Street Railway Company, of Detroit, Mich., has renewed its big chattel mortgage of $3,000,000.

Work on the downtown lines, in Chicago, of the General Electric Railway Company will begin this week.

The electric railroads of the State of Maine have done a very good business during the railroad year, which closed June 30, although no great increase in profits of any of the roads is noted.

The damage to the Metropolitan Railroad Company's big power house in South Washington, D. C., is figured at $20,000. It is reported that the company will rebuild on a larger scale.

General Manager Fransioli, of the Manhattan Railway, New York city, is reported as saying that the storage battery motor on Thirty-fourth street is working well so far, but the experimental stage is not passed.

The report that Mr. J. Pierpont Morgan and other New York capitalists are trying to secure control of the West End Street Railway Company, of Boston, has been denied by Mr. Goodspeed, treasurer of the company.

Town Council revoked the franchises of the Schuylkill, Pa., Electric Railway Company for failing to extend its line through the Heckscherville Valley as agreed to. The trolley cars entered Minersville by leasing the People's railway.

The Consolidated Electric Company, of Santa Barbara, Cal., is now in full control of all the street railway lines in that city. The new company has purchased all the property heretofore owned by the Street Railroad Company and the Citizens' Railway Company. The entire system will be electrically equipped.

It is said that an electric line is to be operated between Anderson, Ind., Marion and Indianapolis and that 15 miles of the track will be in operation within 90 days, and cars will run into Anderson by next April. The cost of the line between Anderson and Marion, is $500,000. The line to Indianapolis will be completed next Summer. Noah J. Clodfelter, of Indianapolis; J. W. Angell and B. J. Arnold, of Chicago, and Mr. Caldwell, of Marion, are interested.

Work on the Springfield, Vt., electric railroad is delayed for lack of funds, and it is now doubtful if the road can be completed before next Summer. There is needed to build and equip the road $150,000, of which $30,000 has been subscribed. The directors have built a bridge over the Connecticut River at an expense of $40,000. Much of the grading of the roadbed has been done and the rails have been purchased, but, because of the stringency of the money market, the company can not dispose of the proposed issue of bonds, and the work is at a standstill.

Compressed air is to be used as the motive power for the cars of the Market Street Railway Company's system, of San Francisco, Cal.

The Southern Electric Railroad Company, of St. Louis, Mo., has filed a deed of trust on all its properties to secure $200,000 in 20-year five per cent gold bonds.

The Manchester, Mo., Electric Railway Company has transferred its property to the St. Louis and Meramec Electric Railway. This means that the two roads will consolidate under the same name and management.

An injunction has been served on the Conway, Mass., Electric Street Railway Company by the New York, New Haven & Hartford Railroad Company, who wish to prevent the extension of the electric road across their land and over the Deerfield River, to connect with the Fitchburg railroad.

The State Railroad Commissioners have granted permission to the Third Avenue Railroad, of New York city, to equip its Kingsbridge extension with the overhead trolley, the permission to continue for 10 years. This extension taps the Third avenue cable road at 162d street and runs to Kingsbridge.

The officials of the Syracuse, N. Y., Street Railroad Company have been discussing the advisability of employing inspectors for the various lines for some time past, and it has been stated on good authority that 15 of the oldest conductors in the employ of the company would be promoted to the inspectorship.

The new Twenty-eighth and Twenty-ninth Street Crosstown Railroad Company, of New York city, which recently acquired all the railroad rights and franchises of the Twenty-eighth and Twenty-ninth Street Railroad Company, has mortgaged the same to the Central Trust Company in the sum of $1,500,000 to secure an issue of bonds, payable in gold in 100 years at five per cent interest. The new company is said to be controlled by interests identified with the Metropolitan Traction Company.

The Boards of Highway Commissioners of the towns of Flushing and Newtown, Long Island, have granted the Brooklyn City Railroad Company permission to cross Strong's bridge over Flushing Creek. The company has agreed to pay $2,000 toward the cost of the new iron bridge, to keep the planking and approaches in repair, and to provide an extra number of electric lights. The work of completing the railroad into Flushing will be pushed forward, and it is expected that cars will be running in a few days, as the rest of the road has been ready for months. The opening of the road will give Flushing a direct connection with Brooklyn for the first time.

ELECTRIC LIGHT FLASHES.

Bellevue, Iowa, is to have an electric light plant, costing $5,587. The poles will be planted in the course of a couple of weeks. The Fort Wayne company's dynamo and electrical machinery will be used in the plant, and an Ideal high-speed engine. The entire plant, it is expected, will undoubtedly be in full running order in 90 days' time. There are 11 arc lights and 47 incandescent street lights.

Sixty miles of electric current will be turned loose in the West Side park system, at Chicago, Ill., October 25. That evening the machinery of the largest municipal electric lighting plant in the world will be for the first time set in motion, and 835 brilliant arc lights will illuminate nearly every foot of the boulevards and parks included in the West Chicago system.

ANCHOR ELECTRIC COMPANY'S NEW SWITCH.

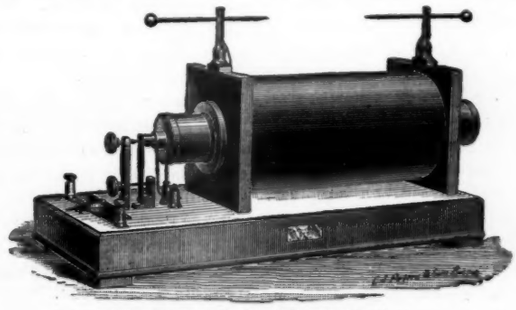
The plant is built to supply sufficient power for 1,300 lights, and when the connecting boulevards between the three park systems are completed, the system will be extended to reach to the Indiana and Michigan Canal, along the Southwest Boulevard, and to Diversey Street Bridge on the north. At the former point the lighting system of the South Park Board will connect with it, and at the latter the Lincoln Park arc lights will begin.

Reading, Pa., first block electric light plant is being erected in the basement of the Mansion House, of that city, by F. E. Bailey (a member of the firm of F. E. Bailey & Company, of Philadelphia), who proposes to run it himself. He may put in half a dozen similar plants in as many different blocks in Reading. It includes a 100-horse-power engine and two dynamos of the latest improved make, with a capacity of from 800 to 1,100 lights, and it may be still further increased if more contracts are signed. The plant will supply light and power in any business place in the square on the south side of Penn between Fifth and Sixth, and it can be operated without franchise from the city, as no poles are erected or wires strung on the street or sidewalk. Competent men will be placed in charge.

Ritchie's New Induction Coils.

Messrs. E. S. Ritchie & Sons of Brookline, Mass., have recently perfected a series of induction coils designed specially for X-ray work, and ranging in spark capacity from one-fourth inch to 30 inches. This apparatus is of particular interest, as the founder of this company, Mr. E. S. Ritchie, in 1857, was the inventor of the method of winding the secondary helix of an induction coil in strata, in planes perpendicular to the axis, thereby improving the insulation and making it possible to increase the length of spark almost indefinitely. This important scientific fact was first published in *Silliman's Journal*, and the new idea was copied from this journal by both the domestic and foreign scientific press. Since that time the method has been generally adopted by all makers of this apparatus. The types of coils now made by the company may be said to mark the highest development, as that made by them in 1857 was the first step.

The induction coil illustrated herewith is known as their 12-inch spark, although the actual spark will be 13 or 13½ inches. The interrupter used is an improved form, and very fine results can be attained with it in X-ray work. It is so constructed that any other form of brake can be furnished. The base is 28½ inches long and 11½ inches wide, and, with the three cells of battery, weighs 75 pounds. In actual operation the induction coils made by E. S. Ritchie always show capacity above their rating; that is, the spark is from one to three inches longer than the instrument is guaranteed for.



E. S. RITCHIE & SONS' INDUCTION COIL.

A New Electrolier Switch.

The switch illustrated herewith is a new design just placed on the market by the Anchor Electric Company, of 71 Federal street, Boston, Mass. The feature of the switch is that three different combinations or groups of lamps in an electrolier may be controlled, one turn of the handle lighting the first group, another turn lights the second group, and three turns light all the lamps, while four turns them all out. This type of switch is also made with a flush plate.

ADVANCE INFORMATION

Valuable News and Tips for Manufacturers and Dealers.

We publish below information relating to new electric railways, new electric light companies, new telephone companies and projected electric construction of all kinds. Every reader will find these columns of special interest, and manufacturers and supply houses will receive many valuable suggestions looking to new business by carefully watching this department in the ELECTRICAL REVIEW.

Electric Light and Power.

LULING, TEX.—Mr. Oscar Star, of Prairie Lea, has bought an interest in the electric light plant here, and will assume charge of its business.

JEFFERSON CITY, MO.—The Electric Light, Power and Conduit Company, of St. Louis, has been incorporated; capital, $50,000. Incorporators: S. M. Dodd, J. C. Van Blarcom, Richard C. Kerens and others.

WEST BAY CITY, MICH. — The West Bay City Clerk can give information concerning construction of municipal electric lighting plant, for which bids will be invited.

GRAND HAVEN, MICH. — City Clerk can give information concerning construction of municipal electric plant.

HARTFORD, CT. — The electric power plant will be extended for lighting the city.

LUDINGTON, MICH.—City Clerk may be addressed concerning construction of $15,000 electric light plant.

VERSAILLES, KY.—City Clerk can give information concerning lighting of city with 20 or more arc lights.

DOVER, N. J.—The Dover Electric Light Company has awarded contracts for erecting a new central station, to cost about $40,000.

BELMONT, MASS.—Town Clerk can give information concerning purchase of local electric lighting plant.

BRYAN, OHIO—An electric light plant is to be established here.

ROSSVILLE, GA.—J. W. Stevenson is interested in the construction of an electric light and power plant.

NICHOLASVILLE, KY. — M. A. Anderson and others are endeavoring to organize a company to erect an electric plant.

LYNDON, KY.—Col. M. H. Crump is in the market for an electric light plant for military academy.

CHATFIELD, MINN.—An electric lighting franchise has been granted to C. R. Madison.

HUTCHINSON, MINN.—A private concern is asking for a franchise for electric lighting for this place.

ONEONTA, N. Y.—The Clinton Mills Power Company has been incorporated to furnish electricity for light, heat or power in the towns of Milford, Hartwick, Middlefield, Otsego and Cooperstown. The amount of stock is $10,000. George Brooks, George M. Jarvis and E. V. Adams, of Cooperstown, are the directors for the first year.

NEW YORK, N. Y.—The Fleischhauer Electric Light and Power Company has been incorporated; capital, $10,000. Directors: John Keenan, Jacob Fleischhauer and Julius Fleischhauer, of New York city.

New Electric Railways.

SONOMA, CAL.—An electric road franchise has been granted from this place to Santa Rosa.

NORTH ADAMS, MASS.—The Fitchburg Railroad Company is making plans for the running of the trains through Hoosac tunnel by electricity, to replace the steam.

PORTCHESTER, N. Y.—The Portchester Electric Railway Company; village trustees considering franchise. The company will build to Mount Vernon, and ultimately to Greenwich, Ct.

DE LAND, FLA.—F. E. Band and others have been granted franchise to construct an electric railway on the streets of the town. More than $100,000 has already been subscribed.

BUFFALO, N. Y.—The Crosstown Street Railroad Company has been granted permission to build and operate trolley lines in four streets.

PALMER, MASS.—The Southbridge & Fiskdale Electric Railroad will probably be extended through Brimfield to Palmer, and a meeting has been held recently for that purpose.

BALTIMORE, MD.—The Falls Road Electric Railway Company has been granted franchise to construct electric road, and work will shortly commence.

ATLANTA, GA.—A project is on foot to build an electric railroad from this place to Marietta. New York capitalists are interested, and they are figuring on building the road for $350,000 or less.

CUMMING, GA.—The people of this place are agitating for an electric line to connect with Atlanta. It is estimated that it will cost $165,000. Cumming will raise $10,000.

EAST BRIDGEWATER, MASS.—I. N. Nutter is interested in the construction of the Brockton, Bridgewater & Taunton electric road.

BRATTLEBORO, VT. — Steps are being taken to construct an electric railroad, and extend it to Cavendish.

FAIR OAKS, CAL.—T. B. Hall and others are interested in the construction of the proposed electric road.

New Manufacturing Companies.

CLEVELAND, OHIO—The Morrison Battery Company has been incorporated; Augustus Morrison, Arthur R. Bullock, Edward E. Eagle, H. L. Smith and John M. Friend, incorporators. They will make electrical devices for the use of dentists and surgeons. The capital stock is $10,000.

CAMDEN, N. J. — Underground Electric Company has been incorporated by Simon J. Martin, Ellery P. Ingham, Frank Battles, Frank R. Hansell. Capital stock, $250,000.

SALT LAKE CITY, UTAH — The Salt Lake Electric Supply Company has been incorporated, with a capital stock of $20,000. R. W. Nichol, president; E. Mill, vice-president, and S. J. Weisel, secretary and treasurer.

SPEARS, PA.—The People's Electrical and Manufacturing Company has been incorporated. Capital, $50,000.

Business Troubles.

CHELSEA, MASS. — Herbert L. Slade, of this place, electrician, has filed a voluntary petition in insolvency.

OSWEGO, N. Y.—Sheriff Selleck has taken possession of the rolling stock of the Lake Ontario & Riverside Electric Street Ralroad on a chattel mortgage for $6,500, held by the Walker company, of Cleveland, Ohio.

NORWALK, CT.—The Norwalk & South Norwalk Electric Light Company has passed into the hands of the General Electric Company, its largest creditor.

CHICAGO, ILL.—Application has been made for a receiver for the Harrison International Telephone Company. Capital stock, $80,000,000.

ROME, GA.—The Rome Electric Light Company; Charles E. Woodruff has been appointed temporary receiver.

Opportunities for Young Men.

The educational department of the Young Men's Institute, 222 Bowery, New York city, opened its doors to young men on October 5. An excellent and thorough work is being done at the institute for those who are occupied during the day. Instruction is being given in the following practical subjects: Steam engineering, practical electricity, freehand, mechanical and architectural drawing, shorthand and typewriting, bookkeeping and penmanship, arithmetic, English grammar, carriage drafting, vocal music and first aid to the injured.

These classes are open to all men of good character between the ages of 17 and 35 years. The instructors are men of experience, and have attained marked success in their particular lines. Those who are practically familiar with the above subjects are taught the theory of the line which they may be following, and thus prepare themselves for more remunerative places. Firemen can prepare themselves for engineers, and engineers can prepare for more advanced work; machinists and designers can get the drawing which is needed for their work; office employés can have the benefit of commercial subjects. The men are thus prepared for greater usefulness in their vocation. The enrollment for 1895-6 was over 600 young men. The school year continues until May, when diplomas and prizes are awarded by the committee of management.

More About Chestnut Trees.

TO THE EDITOR OF ELECTRICAL REVIEW:

On page 160 of your issue of September 30, the question, "Who can tell all about chestnut trees and poles?" is asked in bold headlines.

The sweeping answer *no one* would benefit nothing to the trade, nor accomplish the manifest purpose of the writer of the article.

Large and varied experience in many localities has taught me two first principles which never fail in the selection of chestnut for any purpose; that is, that red chestnut exists more generally on poor lands and in old timber. Red chestnut is more general on eastern and southern slopes, white chestnut on western and northern slopes. These general characteristics—partly recognized in the article referred to—in my judgment lead me to believe the "red" coloring of wood fibre in chestnut is an unmistakable sign of weakness. The weakness is generally admitted by the trade, hence the demand for white chestnut as against red chestnut.

For causes, let us look into our premises. In poor lands the timber is of necessity not as vigorous or strong as in good lands. In old trees the decline has generally set in. Old trees generally have some evidence of decay or weakness—dead limbs, worm holes, decay at the stump, vandal bumps, squirrel holes and the like. In eastern and southern slopes the general conditions for the growth of trees, principally the sudden changes in temperature and the forced growth caused by excessive sun, seem to be the chief destroying elements.

The difference between the two inside colors can generally be distinguished by the experienced eye. Ordinarily, in white chestnut, the color of the bark is a shade lighter, the ross thinner and the cracks in the bark very pale grey. The reverse for red chestnut.

The last inquiry of the writer of the article—whether a thick, rapidly tapering tree is a healthy tree or not—is altogether a matter of individuality, in the very tree, governed by the surroundings. It may be healthy. It may stand in an isolated position, or relatively so. A tree standing in a thick woods has few limbs; one partly exposed has limbs in the direction of its exposure, and a tree standing in an open field has limbs on all sides. All trees, including their leaves, compressed longitudinally would form relative pillars, with very nearly equal diameters at both ends, but the vitality requisite to make the limbs grow seems the logical necessity for the rapid taper. Yours truly,

A. G. SALLADE,
General Manager Sallade Lumber Company.
Reading, Pa., October 5.

SPRING GROVE, MO.—The Spring Grove Investment Company has been incorporated with $14,000 capital stock. The object of the new company is to build bridges, machinery and electrical appliances.

KINDRED INTERESTS

A catalogue of the American arc dynamos, arc lamps and appliances, issued by Chas. J. Bogue, 206 Center street, New York, has been received at this office.

The Anchor Electric Company, Boston, have issued a little booklet, attractive to electrical supply dealers, illustrating the well known "Anchor" switches and push buttons.

The large plant, formerly occupied by the Sessions Foundry Company, at Bristol, Ct., has been vacant since this company's new plant was completed, and is now in the market for rental or sale.

Capt. T. H. Brady, of New Britain, Ct., the manufacturer of mast-arms, hoods and electric lighting specialties, speaks encouragingly of a brighter outlook for that line, as the result of some weeks of travel.

The Sessions Foundry Company, Bristol, Ct., have prepared, for limited distribution, a handsomely framed picture, in colors, of the new plant, which, by the way, is the most extensive of the kind in New England.

The Metropolitan Electric Company, of Chicago, has taken the agency for the car straps of the Sanitary Car Strap Company, which are said to prevent the transmission of disease from the hand of one passenger to another.

A large shipment of the "Ship" electric light carbons has been received from Schiff, Jordan & Company, of Vienna, Austria, by Messrs. Straschnow & Frorup, 39 and 41 Cortlandt street, New York, who are the company's American agents.

Mr. Henry M. Fife, the St. Louis representative of the Goubert Manufacturing Company, will be "at home" at 623 North Main street during the sessions of the street railway convention, to meet visitors who who are interested in this modern type of power apparatus.

The Hart & Hegeman Manufacturing Company, of Hartford, Ct., makers of switches, are establishing an office in the Mail and Express Building, 203 Broadway, New York. Mr. Wm. Taylor, who has been identified with electrical matters in Chicago, will be the New York manager.

The Connecticut Telephone and Electric Company, Meriden, Ct., are preparing for publication one of the most elaborate catalogues which has yet been issued by any of the independent telephone companies. The illustration of the various apparatus will be in the half-tone process, showing well the detail of construction of the instruments.

Business with the American Electric Heating Corporation, of Boston, is now progressing well, and the prospects for the future are very promising. The delivery of apparatus for heating 225 cars of the West End Street Railway Company was completed September 25, which makes a total of nearly 1,500 cars heated by this system at the present time, and the company has an order now on hand to equip 30 cars of the North Chicago street railway.

The Cutter Electrical and Manufacturing Company announce a new edition of their circuit breaker catalogue, complete and accurate as to price and data to October 1. This edition will be known as the "Engineers' Edition." The Cutter company have been led to bring out a new catalogue by reason of the success which attended the former edition, published in May last. They do so with a hope of giving information as to the scope of their work in this important and, until recently, much neglected field. The protection of circuits carrying heavy currents is a subject of first importance to users of electricity, and the fact that this company have been able to produce a device so entirely satisfactory, is not due to accident, but is the result of long and expensive research and experiment. This edition is made of a size which can be conveniently carried in the pocket. It is very handsomely printed in two colors and artistically and suitably bound. A few pages are devoted to the important details of the well known C-S switch, so that the possessor of this catalogue has at hand for immediate reference a concise description of the output of the Cutter company's factory, well known, as it is, for producing work which is electrically and mechanically of the highest standard of excellence. This catalogue will be sent on application to the Philadelphia office of the company.

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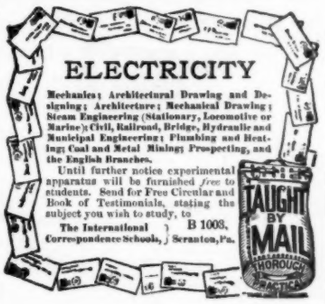
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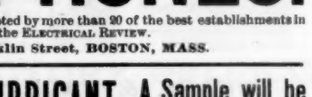

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Gentlemen: The sample stick of Dixon's Commutator Graphite was received, and is giving entire satisfaction. It is considered by our engineer superior to anything else he has ever seen for a commutator lubricant. Yours truly, COFFIN VALVE COMPANY, Neponset, Mass.

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ELECTRICAL PATENTS

[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED OCTOBER 6, 1896.

568,724 Apparatus for electro-deposition of gold or silver; E. Andreoli, London, England.

568,740 Electric slide for chandeliers; G. J. Carson, Chicago, Ill.

568,756 Insulated electric cable; M. Guilleaume, Germany—An electric cable furnished with insulating material arranged inside and outside alternate convolutions of windings of fibrous material.

568,779 Electric locomotive; J. E. Lockwood, Detroit, Mich.

568,783 Switch for electric heating devices; J. E. Meek, New York—A switch comprising a rotatable make and break circuit device inclosed within an exterior casing, the axle whereof is transverse to the axis of the make and break device.

568,798 Electric arc lamp; R. Schefbauer, Hoboken, N. J.

568,840 Telephone switchboard; L. W. Davis, Mineral, W. Va.—A series of contact plates, connected with a call bell, a series of contact plates connected to a different line wire, the central instrument and contact rods, the ground connections and plugs.

568,861 Electric arc lamp; N. G. Meade, Jamestown, N. Y.—A screw clutch composed of a collar, ratchet wheel, spring, hinged jaws, with a beveled collar and means for actuating the clutch.

568,863 Means for generating electric waves or oscillations; D. McF. Moore, Newark, N. J.—A frame holding a series of spring-actuated supports moving between suitable stops or abutments and each carrying a circuit interrupter adapted to operate by momentum and means for alternately actuating said supports against the springs and releasing them in succession.

568,891 Electric motor truck; N. C. Bassett, Lynn, Mass.—A truck having elastically supported motor-carrying bars and an electric motor pivoted thereto in the line of the center of gravity of the machine and geared to the driven axle or axles.

568,919 Socket for incandescent electric lamps; J. Pass, Syracuse, N. Y.—A two-part socket comprising a body and a base portion, contacts in the base, co-operating contacts in the body and a single screw connecting the body and the base and serving as a lamp terminal.

568,934 Electric mining machine; R. H. Wiles, Freeport, Ill.—A suitable carriage, devices arranged upon the carriage to cut a kerf into which the carriage may advance, means for forcing the carriage into the kerf so cut, and a wheel revolvably mounted upon the carriage and arranged to bite into one of the kerf's broader walls as the carriage is forced forward.

568,947 Oscillating reciprocating tripolar electric motor; T. H. Hicks, Detroit, Mich.—A solenoid with a tripolar magnet.

568,964 Electric cable; S. P. Thomson, London, England—The combination with an electric cable for submarine use having two insulated conductors, of an intermediate piece of special cable containing also a bridge wire possessing both self-induction and high resistance, the insulating material surrounding said bridge wire being continuous with the insulation surrounding the two insulated conductors.

568,971 Multifuse cut-out; W. Ehrhardt, Union, N. J.

568,993 Lock and block signaling on railways; W. R. Sykes, London, England.

568,995 Flush tank with electric attachment; H. Thwaite, Philadelphia, Pa.

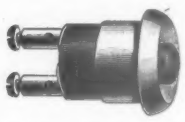
569,018 Telephone; A Gartner, Newark, N. J.—A telephone receiver and its diaphragm, a series of balls arranged in the receiver and forming an annular bearing for one side of the diaphragm and an annular curved flange also arranged in said receiver and forming the bearing for the other side of said diaphragm.

569,099 Electric clock-striking mechanism; F. E. Girod, Geneva, Switzerland.

569,101 Automatic electro-magnetic brake for railway cars; E. A. Hauerwas, Saratoga Springs, N. Y.—A car brake comprising an electro-magnet in a normally open local circuit, a closer for said circuit and a main circuit for controlling said closer, an air-brake controlling armature comprises in said main circuit, and an electro-magnet in a circuit comprising a track section for controlling said armature.

16 Conductors to 1 Car.

This ratio is obtained by using the "C" push button, illustrated herewith, and made by Huebel & Manger, of Brooklyn, N. Y. The street railway companies, in all the large cities, are furnishing their patrons with this convenient method of stopping the car when desired. While the "real, live" conductor is busy collecting



ELECTRIC PUSH BUTTON FOR STREET CARS.

fares, and hasn't time to see who is striving to attract his attention, this little button is pressed into service by the slightest touch of a lady's finger, and the car comes to a stop, without interrupting the cash man in his pleasant occupation of raking in the nickels.

GENERAL NOTES.

The People's Electric Light and Power Company, of Newark, N. J., will begin lighting the streets of Harrison with electricity in a few days, under a five-year contract.

There is to be a new electric lighthouse placed on Fire Island that will have the estimated power of 450,000,000 candles, making it the most powerful artificial light in the world.

Last year the personal estate of the Boston Electric Light Company was assessed at $325,000; this year it is assessed at $2,000,000. The personal estate of the Edison Electric Illuminating Company of Boston has been increased $100,000.

It is stated in Halifax, N. S., that H. M. Whitney, on behalf of the People's Heat and Light Company, has closed a $300,000 deal with the Halifax Gas Company. At Mr. Whitney's offices, in Boston, it was said that the story was very probable.

The plant of the Gorham, N. H., Electric Light and Power Company is to be enlarged, and the company will apply to the next legislature for a charter to build an electric road between Berlin and Gorham. J. F. Libby is one of the projectors of the scheme.

A dispatch from Montreal, P. Q., says that the French Cable Company has begun to lay a direct cable from New York to Martinique, Guadaloupe and French Guiana. France proposes to control her own system of communication between all her American independencies.

At the annual election of the Gettysburg Electric Light, Heat and Power Company, at Hummelstown, Pa., the following were chosen: President, E. M. Hoffer; treasurer and general manager, Adam Ertter; secretary, Wm. Wible; directors, E. M. Hoffer, Adam Ertter, John A. Livers, Wm. Lewis Mizel.

There has been put in the Cornwall, N. Y., electric light plant lately a storage battery consisting of 100 batteries. They supply the electric current for the telegraph company at both the tower and West Shore stations at the landing. The storage battery at the landing station has been done away with.

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REFERENCES: "Electrical Review," New York; Paul Cromlein, Teller Lincoln National Bank, Washington, D. C.; Judge Geo. D. Parker, Berkley, Va.; Second National Bank, Washington, D. C.; E. K. Leech, U. S. Mint, Philadelphia, Pa.; W. F. Newell, Manager and Secretary Water Works, Olympia, Oregon.

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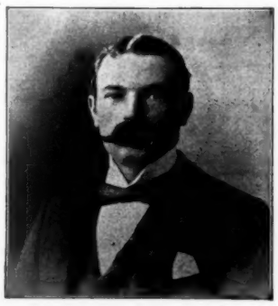

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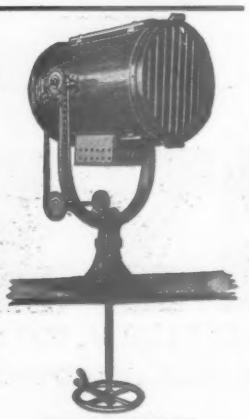

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